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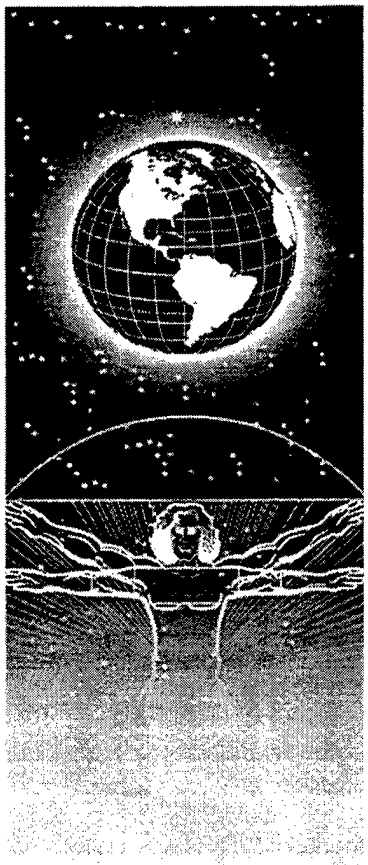

UNITED STATES AIR FORCE RESEARCH LABORATORY

Integrated Technical Information for the Air Logistics Center: Enhancing Maintenance Technician Task Performance

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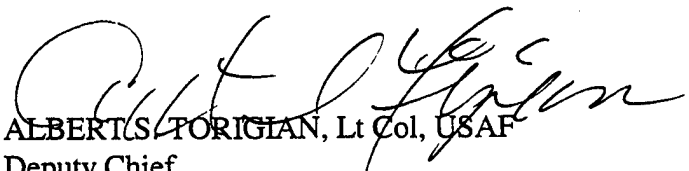

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This technical paper documents the final results of an analysis of the task environment under which depot maintenance technicians perform their jobs--specifically, programmed depot maintenance (PDM) for F-15 aircraft. This effort has resulted in a detailed system-level analysis of PDM activities in which an understanding of the PDM process, specific major jobs with the process, and the types of support necessary for successful job completion have been identified. The motivation for this research was to identify activities in the process that would most benefit from technologies expected from the Integrated Technical Information for the Air Logistics Center (ITI-ALC) Program.

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PREFACE

The research documented in this technical paper was performed by the Georgia Tech Research Institute (GTRI) under the sponsorship of the University of Dayton Research Institute (Contract Number RI-39681X). The contracting officer's technical representative (COTR) is Ms. Laurie Quill. The GTRI program manager for this contract is Dr. Deborah A. Mitta. The lead GTRI unit for the performance of this work is the Electronic Systems Laboratory, directed by Mr. William S. Rogers, Jr. (Interim Director).

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SECTION 1.
INTRODUCTION

Background

This technical paper documents the final results of an analysis of the task environment under which depot maintenance technicians perform their jobs--specifically, programmed depot maintenance (PDM) for F-15 aircraft. This effort has resulted in a detailed system-level analysis of PDM activities in which an understanding of the PDM process, specific major jobs within the process, and the types of support necessary for successful job completion have been identified. The motivation for this research was to identify activities in the process that would most benefit from technologies expected from the Integrated Technical Information for the Air Logistics Center (ITI-ALC) Program.

In performing our analysis of the PDM task environment, three sources of information were considered: task analysis results--specifically, the types of support required for successful completion of individual PDM jobs; 15 Business Process Improvements (BPIs) defined for the ITI-ALC Program under an effort directed by the Systems Research and Applications (SRA) Corporation (SRA Corporation, 1995a, 1995b); and insights and comments offered by personnel from the Warner-Robins Air Logistics Center (WR-ALC). The data collected from WR-ALC was used to verify results obtained from written documentation of the PDM process and made available through WR-ALC personnel (WR-ALC, 1997).

During the preliminary stages of our analysis of the PDM task environment--in order to gain an appreciation for ITI-ALC and its role within the PDM process, as well as an understanding of PDM and the needs of PDM technicians--we reviewed results from an initial ITI-ALC study conducted by the SRA Corporation (SRA Corporation, 1995a, 1995b). This effort yielded "AS-IS" and "TO-BE" information and activity requirements of PDM operations, where Integrated DEFinition (IDEF) models were used to document depot operations for all Air Force ALCs. The 15 BPIs defined for ITI-ALC were identified through the IDEF models. These IDEF models served as input data for the analysis conducted under the present effort.

The U.S. Air Force, with all of DoD, is under continuing pressure to reduce operational costs. One area offering the potential for significant cost reduction pay-offs is the preparation and presentation of technical and management data for aircraft maintenance. Previous assessments have demonstrated that integrated presentation of technical and management data can reduce operational costs in flightline environments. Integrated data reduces errors in task performance, time required to perform maintenance tasks, some special skills required of users, and the number of spare parts used for maintenance.

Extending the research beyond the flightline, the ITI-ALC development effort is seeking to provide information systems to support upgraded depot level functions. In carrying out its objective to improve the quality and availability of technical and

management information (and thus improve the process associated with air logistics center maintenance and support operations, ITI-ALC is focusing on requirements of the maintenance technician. By integrating information from a wide range of systems, it will offer the technician a single, readily accessible source of information, capable of supporting maintenance operations. While the ITI-ALC effort has been working toward meeting its objective by modeling depot functions, activities, and architecture, user-centered considerations have been limited.

Scope

In this effort, we have focused on the specific needs of maintenance technicians across several skill types and a range of PDM jobs. In focusing on technicians' needs, we have identified areas of the PDM task environment that would most benefit from the insertion of ITI-ALC technologies. In this report, the method used in conducting this analysis is described. By conducting this analysis, we have been able to address the following questions.

1. What functions must be executed within the task environment?
2. What special features/characteristics of the task environment can be identified, and what alternatives for addressing those special features can be supported by an ITI-ALC system?
3. Given a definition of environment functionality, what tasks must the maintenance technician perform to ensure that this functionality is executed?
4. Can maintenance technicians be categorized according to role? If so, what roles exist?
5. What are the maintenance technician's information requirements?
6. How do information requirements vary with respect to technician role?
7. Can we identify major activities performed by maintenance technicians?
8. To what extent can we examine BPIs and their effects on maintenance technicians?

Contents of Technical Paper

The remaining sections of this paper document the systems analysis activities conducted as a result of this research effort. The approach used in analyzing the PDM task environment is presented in Section 2. This systems-based approach required an identification and examination of the areas of functionality associated with PDM, an understanding of the PDM process flow (i.e., the sequence in which functions are executed within PDM), detailed breakdowns of specific jobs assigned to these functional areas, a specification of support requirements (e.g., the types of information, equipment, and knowledge required for successful completion of PDM jobs), and a validation of these analyses results (based upon inputs from maintenance personnel at WR-ALC). Section 3 provides analysis results, and Section 4 discusses their implications.

Section 4 offers two prioritizations of the PDM functional areas identified in Sections 2 and 3, where each prioritized list reflects our consideration of the PDM function set in terms of one of two criteria. By generating each of these prioritized lists, we can identify

PDM functions that would benefit most from the insertion of ITI-ALC technologies. The two criteria were used to prioritize PDM functions were (1) the number of BPIs addressed by a given function's support requirements and (2) the extent to which a function's respective support requirements addresses the 10 BPIs of interest in the present project.

Two appendices are also included in this technical paper. Appendix A contains results of the detailed breakdowns derived for PDM jobs. Critical path jobs were the focus of this particular research effort, and as such, breakdowns for all critical path PDM jobs are provided. Also provided in Appendix A are detailed breakdowns for other inspections and ops checks not included in the critical path. Appendix B contains the support requirements specification. Support requirements defined for a subset of major PDM jobs (where each of these jobs is assigned to a given PDM function) are defined. The jobs in this subset are referred to as critical path jobs.

SECTION 2.
APPROACH

In general, a four-step approach was applied in obtaining and analyzing data specific to the PDM task environment. The primary purpose of this analysis effort was to identify those areas of PDM functionality that would receive the greatest benefit from ITI-ALC technologies. Analysis of the PDM process entailed the following steps.

1. Specify PDM functional areas.
2. Assign each major PDM job to an appropriate functional area.
3. Derive detailed breakdowns of critical path jobs--i.e., conduct a task analysis.
4. Specify support requirements for critical path jobs--i.e., determine the types of support required for successful job completion

Initially, an information gathering session was held at WR-ALC. This on-site session was held in order to obtain an overview of the PDM process. Insights from re-engineering personnel located at WR-ALC pointed to weaknesses in the process that could benefit from ITI-ALC support. The bulk of the analysis work was performed during steps three and four and was based on information provided from maintenance personnel (supervisor and technician comments), as well as an analysis of written documentation describing the PDM process and made available by WR-ALC personnel (WR-ALC, 1997). Results obtained during steps three and four were verified against information gathered during a second on-site session held at WR-ALC. This session provided an opportunity for questions and answers on the analysis results and allowed us to eliminate any remaining analysis "holes".

Once the support requirements for each critical path job were specified (where each job was assigned to a functional area), they were consolidated across functional area. In this manner, each functional area, and the jobs assigned to that area, were associated with a set of support requirements. Upon completion of this consolidation exercise, the support requirements were considered with respect to 10 BPIs. By considering the links between types of support and the BPI subset, we could assess the extent to which ITI-ALC technologies would enhance the successful execution of PDM functions and thus understand those aspects of functionality that would receive greatest benefit from such technologies.

Overview of the PDM Process

The PDM process can be defined in terms of the following seven areas of functionality. (A detailed description of each function will be provided in Section 3.)

1. REMOVALS
2. MODS
3. BUILDUPS
4. INSTALLATIONS
5. CHECKS
6. INSPECTIONS
7. FACILITATIONS

The process flow chart of Figure 1 reflects the general sequence in which PDM functions are executed. (Table 1, identifying the 52 major jobs in PDM, also confirms this sequence.) The feedback loop has been included to indicate that various checks and inspections are included as tasks during BUILDUPS and INSTALLATIONS jobs. They might be considered as "mini" checks or inspections. In other words, they are distinct from the major PDM jobs assigned to the CHECKS and INSPECTIONS functions.

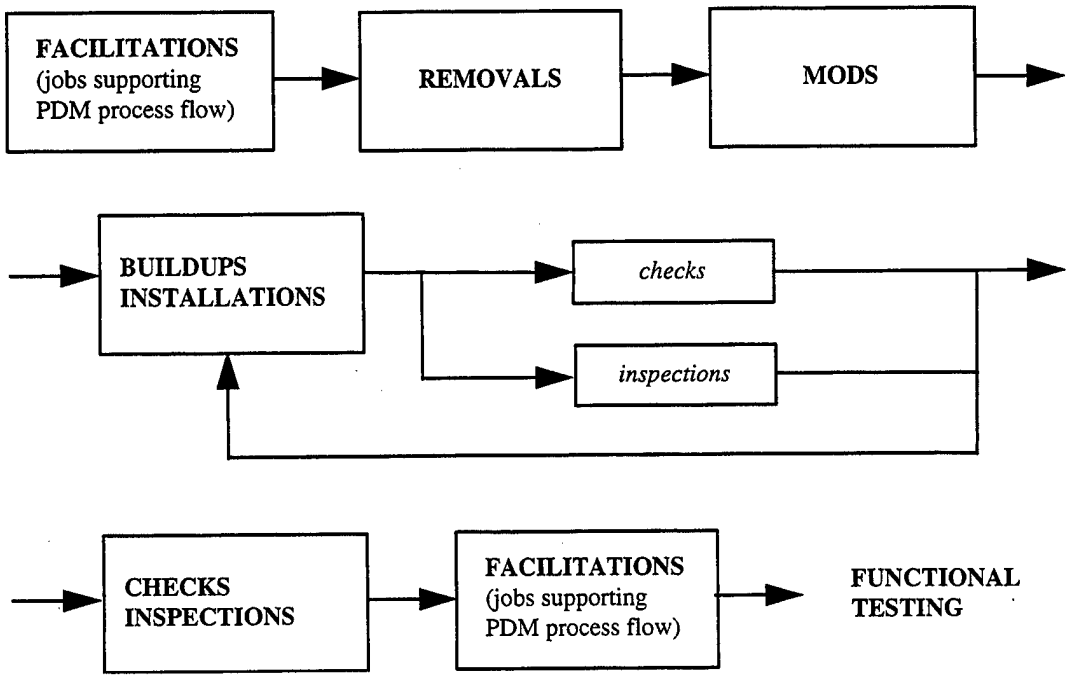

Figure 1. Programmed Depot Maintenance Process.

During on-site discussions with WR-ALC personnel, five PDM skill types were identified: AC (aircraft), AE (electrician), AH (hydraulics), AN (weapons), AS (sheet metal). AC technicians are responsible for replacing the fuel cell bladder and installing flight controls. They also have responsibility for maintenance activities required for the ramp, rudder wings, ailerons, and canopy. AE technicians have responsibility for aircraft electrical systems/subsystems, and AS technicians have responsibility for all structural aspects of the aircraft (e.g., fabrication of brackets). The typical maintenance crew is comprised of three AC technicians, two AE technicians, and three AS technicians. AH technicians "float", and at WR-ALC this particular skill type is used on an as-needed basis across multiple aircraft.

Table 1. Major Jobs Comprising PDM

Job No.	*Job Code*	*Job Description*
1.	**BW**	**Accept from predock**
2.	**FD**	**AE removals**
3.	**FK**	**AN removals**
4.	DP	TI inspection

Table 1. (cont'd) Major Jobs Comprising PDM

Job. No.	*Job Code*	*Job Description*
5.	FM	AH time compliant technical order (TCTO) removals
6.	DF	AC removals
7.	DQ	4A clean
8.	FL	AC TCTO removals
9.	EZ	AS TCTO removals
10.	DG	AS removals
11.	DB	AH removals
12.	EY	AE TCTO removals
13.	DT	AH buildup
14.	DI	E & I inspection
15.	**DC**	**AC remove fuel tanks**
16.	FR	AH TCTO mods
17.	DW	AP install AMAD
18.	FS	AH TCTO installs
19.	FQ	AC TCTO installs
20.	EL	AS TCTO installs
21.	DS	3S moddock paint
22.	PS	AE panel shop
23.	DO	NDI
24.	FU	AE TCTO mods
25.	**DK**	**AC fuel tank buildup**
26.	SP	support jobs
27.	DX	AH install gear
28.	EH	AS TCTO installs
29.	DV	AC buildup
30.	**FV**	**AE TCTO installs**
31.	DZ	AC reposition A/C
32.	FB	Egress buildup
33.	EF	3S paint flt. ctl. surfaces
34.	OI	Misc TCTO/compliances
35.	**DY**	**AC ramp buildup/install**
36.	FG	AN buildup
37.	EC	AE buildup
38.	**EW**	**AS buildup**
39.	HW	AH install wing
40.	**EA**	**AC install wing**
41.	EQ	Wing twist alignment
42.	**EX**	**AC install flt. ctl.**
43.	ES	AC clean/close panels
44.	EM	AE ops check
45.	EO	AN ops check
46.	**EJ**	**AH ops check**
47.	**EK**	**AC ops check**
48.	ER	AH fuel ops
49.	ET	AC fuel ops
50.	**EU**	**AE fuel ops**
51.	**FI**	**AE inspect engine bays**
52.	**ZZ**	**Deliver to FT**

Multi-Stage Improvement Program

Conducting the task analysis also incorporated information from the Multi-Stage Improvement Program (MSIP). We began by considering the 52 major jobs associated with the PDM process. These specific jobs and the sequence in which they are performed have been defined by the Multi-Stage Improvement Program (MSIP). In addition to ensuring the proper sequencing of PDM activities, MSIP has facilitated the tracking of job completion.

At the initial stages of a job sequence, MSIP can be used to identify potential scheduling problems. In this manner, conflicts can be identified and accommodated through schedule adjustments. Under MSIP, a sequence of 15 major jobs defines a *critical path* for the PDM process. These jobs are regarded as critical because they are known to create process bottlenecks if not completed according to schedule requirements. Ultimately, noncompliance with the job completion schedule will delay an aircraft's delivery to functional testing. Table 1 identifies the 52 major jobs in PDM, where boldfaced table entries indicate critical path jobs.

Another aspect of MSIP is the MSIP chart. This chart is the means by which a visual record of PDM activities for a given aircraft is maintained. It documents the sequencing of the 52 major jobs, where each job is assigned a two-letter job code. The chart essentially depicts two matrices. The first is a *major job* x *day number* matrix, where each row is assigned to a major PDM job, and each column is assigned to a single day (for a given month and year). The data entered in a row of this matrix specify the amount of time (in units of days) spent toward completion of the respective PDM job.

Each column of the second matrix (*skill type* x *day number*) indicates the number of manhours contributed by each of six skill types for the respective day number. Each skill type is assigned a unique color code. Major jobs are also color coded according to skill type (and thus to skill type color codes). The exceptions to this color coding strategy are critical path jobs. They are coded in red. Figure 2 provides a general layout of a MSIP chart.

	YEAR **Month** **day:**	1	2	3 ...
Major Job: FM - AH TCTO removals DF - AC removals DQ - 4A clean . . .				
Skill Types: MISC AH AN AE AS AC		hrs	hrs	hrs

Figure 2. Layout of MSIP Chart.

SECTION 3.
RESULTS: ANALYSIS OF THE PDM PROCESS

In this section, results of the systems analysis are presented. One primary objective of this research was to identify functionality associated with the PDM process and ultimately those aspects of the programmed depot maintenance (PDM) task environment that compromise the timely completion of process jobs and consequently would receive the greatest benefit from the insertion of ITI-ALC technologies. This section describes the approach used in identifying the functions to receive the greatest benefit from ITI-ALC.

PDM Functionality

In order to gain a more detailed understanding of the PDM process, as well as an understanding of the types of jobs that contribute to process delays, we conducted a detailed analysis of PDM jobs. The focus of this effort was directed toward the 15 critical path jobs. To characterize the PDM process, we identified seven areas of functionality and assigned each major job to one of these functions. The following seven areas of functionality were specified.

- REMOVALS
- MODS
- BUILDUPS
- INSTALLATIONS
- CHECKS
- INSPECTIONS
- FACILITATIONS

Within each function, major jobs were separated according to the following skill types: AC (aircraft), AE (electrician), AH (hydraulics), AN (weapons), AS (sheet metal). These five skill types were identified during on-site discussions with WR-ALC personnel. They were also specified in written documentation of the PDM process (WR-ALC, 1997). A sixth skill type, referred to as *miscellaneous*, was used to for those jobs not assigned specifically to one of the five skill types identified above.

The assignment of major jobs to PDM functionality is provided in Tables 2 through 8. Each table identifies the jobs assigned to a given function. Corresponding skill types and job sequence are also indicated. (Job sequence is indicated through each job's corresponding job number.) Boldfaced table entries indicate critical path jobs. The assignments of major jobs to PDM functionality (according to skill types) documented in Tables 2 through 8 suggest that for the most part, within a given function, an equal distribution of major jobs to skill types exists. The exception is the function INSPECTIONS, where only two of the five basic skill types (AC and AE) are represented. The remaining inspections are performed by inspectors.

Table 2. Major Jobs and Skill Types Associated with REMOVALS

Skill Type	*Major Job*
AC: Aircraft Skill	6. AC removals (assisted by AS) 8. AC TCTO removals 10. assist AS removals **15. AC remove fuel tanks**
AE: Electrician Skill	**2. AE removals** 10. assist AS removals 12. AE TCTO removals
AH: Hydraulics Skill	5. AH TCTO removals 11. AH removals
AN: Weapons Skill	**3. AN removals**
AS: Sheet Metal Skill	6. assist AC removals 9. AS TCTO removals 10. AS removals (assisted by AE and AC)
Miscellaneous Skill	no major jobs assigned

Table 3. Major Jobs and Skill Types Associated with MODS

Skill Type	*Major Job*
AC: Aircraft Skill	no major jobs assigned
AE: Electrician Skill	22. AE panel shop 24. AE TCTO mods
AH: Hydraulics Skill	16. AH TCTO mods
AN: Weapons Skill	no major jobs assigned
AS: Sheet Metal Skill	no major jobs assigned
Miscellaneous Skill	no major jobs assigned

Table 4. Major Jobs and Skill Types Associated with BUILDUPS

Skill Type	*Major Job*
AC: Aircraft Skill	**25. AC fuel tank buildup** 29. AC buildup (assisted by AS) **35. AC ramp buildup/install**
AE: Electrician Skill	37. AE buildup **38. assist AS buildup**
AH: Hydraulics Skill	13. AH buildup
AN: Weapons Skill	36. AN buildup
AS: Sheet Metal Skill	29. assist AC buildup **38. AS buildup (assisted by AE)**
Miscellaneous Skill	32. Egress buildup (AR Skill)

Table 5. Major Jobs and Skill Types Associated with INSTALLATIONS

Skill Type	*Major Job*
AC: Aircraft Skill	19. AC TCTO installs **40. AC install wing** **42. AC install flt. ctl.** (assisted by 3S Skill)
AE: Electrician Skill	**30. AE TCTO installs**
AH: Hydraulics Skill	18. AH TCTO installs 27. AH install gear 39. AH install wing
AN: Weapons Skill	no major job assigned
AS: Sheet Metal Skill	20. AS TCTO installs 28. AS TCTO installs
Miscellaneous Skill	17. AP install AMAD (AP Skill) **42. assist AC install flt. ctl.** (3S Skill)

Table 6. Major Jobs and Skill Types Associated with CHECKS

Skill Type	*Major Job*
AC: Aircraft Skill	44. assist AE ops check **47. AC ops check** 49. AC fuel ops
AE: Electrician Skill	44. AE ops check (assisted by AC) **50. AE fuel ops**
AH: Hydraulics Skill	41. assist wing twist alignment **46. AH ops check** 48. AH fuel ops
AN: Weapons Skill	45. AN ops check
AS: Sheet Metal Skill	no major jobs assigned
Miscellaneous Skill	34. Misc TCTO/compliances (AJ Skill) 41. Wing twist alignment (DA Skill--assisted by AH)

Table 7. Major Jobs and Skill Types Associated with INSPECTIONS

Skill Type	*Major Job*
AC: Aircraft Skill	14. assist E & I inspection
AE: Electrician Skill	**51. AE inspect engine bays**
AH: Hydraulics Skill	no major jobs assigned
AN: Weapons Skill	no major jobs assigned
AS: Sheet Metal Skill	no major jobs assigned
Miscellaneous Skill	4. TI inspection (JA Skill) 14. E & I inspection (DD Skill--assisted by AC) 23. NDI (DA Skill)

Table 8. Major Jobs and Skill Types Associated with FACILITATIONS

Skill Type	*Major Job*
AC: Aircraft Skill	31. AC reposition A/C 43. AC clean/close panels (assisted by 3S and AP) **52. Deliver to FT**
AE: Electrician Skill	**52. Deliver to FT**
AH: Hydraulics Skill	**52. Deliver to FT**
AN: Weapons Skill	no major jobs assigned
AS: Sheet Metal Skill	no major jobs assigned
Miscellaneous Skill	**1. Accept from predock (SA Skill)** 7. 4A clean (4A Skill) 21. 3S moddock paint (3S Skill) 26. support jobs--range of skills (3S, DA, YG) 33. 3S paint flt. ctl. surfaces (3S Skill) 43. assist AC clean/close panels (3S and AP Skills)

Critical Path Jobs

The focus of the detailed analysis of the PDM task environment was the set of 15 critical path jobs. Table 9 specifies the critical path jobs comprising the PDM process. The sequence number assigned to a given job identifies the order in which it is performed within the 52-step sequence defined by MSIP. In some instances a job title identifies one of five skill types as having primary responsibility for performance of that job. Each skill type--hydraulics, weapons, electrician, sheet metal, and aircraft--is assigned a two-letter code: AH (hydraulics), AN (weapons), AE (electrician), AS (sheet metal), AC (aircraft). Also provided in Table 9 is the assignment of each critical path job to its respective PDM functional area.

The detailed analysis of PDM critical path jobs yielded a complete breakdown of each job, where the activities (tasks) required for job completion were specified. These activities were defined from available MSIP documents--specifically, an MSIP chart and a set of job descriptions made available by a supervisor at WR-ALC (WR-ALC, 1997)--as well as inputs obtained from two on-site consultation sessions held at WR-ALC. During these sessions, an experienced supervisor provided detailed information on the PDM process. Included were a number of insights regarding weaknesses and deficiencies in the process as a whole.

Table 9. PDM Functions and Respective Critical Path Jobs

Function	*Sequence Number*	*Associated Critical Path Jobs*
REMOVALS	2	AE Removals
	3	AN Removals
	15	AC Remove Fuel Tanks
MODS		no associated critical path jobs
BUILDUPS	25	AC Fuel Tank Buildup
	35	AC Ramp Buildup/Install
	38	AS Buildup
INSTALLATIONS	30	AE Time Compliant Technical Order (TCTO) Installs
	40	AC Install Wing
	42	AC Install Flight Control
CHECKS	46	AH Ops Check
	47	AC Ops Check
	50	AE Fuel Ops
INSPECTIONS	51	AE Inspect Engine Bays
FACILITATIONS	1	Accept from Predock
	52	Deliver to Functional Testing (FT)

Descriptions of each critical path job are provided in the following subsections. These descriptions provide top-level summaries of the task analysis results. Each description was derived from the detailed breakdown associated with its respective critical path job in accordance with written documentation available on the PDM process (WR-ALC, 1997). Refer to Appendix A for detailed breakdowns of all critical path jobs.

REMOVALS

AE removals. Major activities under the job *AE Removals* include removing components; performing foreign object damage (FOD) inspection; satisfying inventory requirements for removed components (tag and store removed component for reinstallation); disconnecting electrical connectors; and cleaning locations from which components are removed and disconnected.

AN removals. Major activities under the job *AN Removals* include removing multipurpose displays, processors, power supply and power supply assembly, up front control unit, and avionics interface unit; and satisfying inventory requirements for all removed items (retain removed items for reinstallation).

AC remove fuel tanks. Major activities under the job *AC Remove Fuel Tanks* include removing components associated with tanks, residual fuel, and plumbing/hardware; maintaining an inventory of removed components; disconnecting engine feed lines; visually inspecting for corrosion (manual); performing FOD inspection; cleaning locations from which components are removed and disconnected; and cleaning for foam contamination.

BUILDUPS

AC fuel tank buildup. Major activities under the job *AC Fuel Tank Buildup* include installing many of the fuel tank components removed during the job *AC Remove Fuel Tanks*; recording the completion of installation procedures (via AFTO Form 95 entries); removing/replacing/reinstalling components in support of fuel system vent pressure check; connecting test equipment to the A/C; making pressure adjustments/corrections; conducting inspections/checks; maintaining an inventory of removed parts and test kit caps/plugs; and cleaning.

AC ramp buildup/install. Major activities under the job *AC Ramp Buildup/Install* include #1, #2, and #3 ramp installations; alignment and foreign object inspections; rigging checks; and checks to ensure that FOD curtain bolts are safety wired.

AS buildup. Major activities under the job *AS Buildup* include installations and reinstallations (e.g., fasteners, brackets, nutplates), inspections for foreign objects and debris, repair of the cast in left/right side place seals, and cleaning.

INSTALLATIONS

AE TCTO installs. Major activities under the job *AE TCTO Installs* include installations/reinstallations of electrical components and accompanying assemblies and attaching hardware; continuity checks and foreign object checks; inspections to ensure presence of components; connections (e.g., from components to attaching hardware); and removals of attaching hardware.

AC install wing. Major activities under the job *AC Install Wing* include the transfer of left and right wings from the transportation vehicle to the installation dolly; installations of left/right wings and the air refueling receptacle; temporary installation of the aft IFR slip-away door; control rod inspections to ensure proper hardware installations in the left and right wings; panel closings; and serial number recordings.

AC install flight control. Major activities under the job *AC Install Flight Control* include installations and reinstallations of flight control components; connections and reconnections; and the recording of serial numbers for installed flight control components.

CHECKS

AH ops check. Major activities under the job *AH Ops Check* include operational checks of A/C hydraulics; providing assistance/support to AE and AN skills (e.g., AE and AN ops checks); cleaning areas at which ops checks have been performed; and servicing hydraulics system components.

AC ops check. Major activities under the job *AC Ops Check* focus primarily on operational checks for A/C systems (including flight control systems).

AE fuel ops. Major activities under the job *AE Fuel Ops* primarily include operational checks of electrical system components; inspections for foreign object damage; flushing fuel through refueling receptacles and right/left engine feedlines and single point fueling/defueling receptacle; cleaning; and compliance with all cautions and personnel protective equipment requirements; other activities include calibration of the fuel quantity system; the closing of left/right shutoff valves; and the capping of engine feedlines.

INSPECTIONS

AE inspect engine bays. Major activities under the job *AE Inspect Engine Bays* include ensuring compliance with steps 17-17.3; conducting inspections for foreign objects/debris, corrosion, security damage, abrasions, and chafing; and cleaning.

FACILITATIONS

Accept from predock. The major activity under the job *Accept from Predock* includes docking the F-15 such that PDM and UDLM projects can be completed.

Deliver to FT. Major activities under the job *Deliver to FT* include towing the F-15 to the operational check area and then from the operational check area to the purge station; performing de-docking procedures (re-opening/re-closing doors, removing work stands, removing protective covers from sharp edges); de-arming the F-15 prior to towing; and in the towing process to secure the F-15 and position the fire bottle.

Specification of Support Requirements

Once each critical path job was characterized according to specific tasks, a set of support areas was specified. That is, each job was defined in terms of the types of support required for successful performance of that job. These areas of support (essentially a set of information requirements for a job's corresponding skill type) were considered to be facilitators of job performance. Refer to Appendix B for the details of this support requirements specification.

Support types were consolidated within each PDM function (across the major jobs assigned to each function). The results of this consolidation effort are provided below. In defining support types, we have specified generic types of support--i.e., information

requirements that are applicable to all jobs within the given functional area. We have also included specialized types of support--i.e., support requirements specific to a particular critical path job.

REMOVALS: AE Removals, AN Removals, AC Remove Fuel Tanks

SUPPORT

Generic

- ready access to proper tools/equipment (i.e., hardware items) for performing removals and disconnects
- proper storage arrangements for removed parts
- consistent inventory procedures for removed parts
- knowledge of (or access to) inventory procedures
- knowledge of (or access to) removal and disconnect procedures--e.g., on-line electronic diagrams
- availability of required or specialized cleaning equipment

Specialized: AC Remove Fuel Tanks

- proper storage arrangements for #1 tee assembly parts
- knowledge of (or access to) rules/procedures for performing manual corrosion inspection
- knowledge of (or access to) process for improving bottom backing board

BUILDUPS: AC Fuel Tank Buildup, AC Ramp Buildup/Install, AS Buildup

SUPPORT

Generic

- ready access to appropriate equipment/tools (i.e., hardware items) for performing installations, reinstallations, removals, connections, repairs, and cleanings
- knowledge of (or access to) procedures/information (e.g., electronic diagrams) required for conducting installations, reinstallations, removals, connections, repairs, and cleanings
- availability of parts/components to be installed, reinstalled, connected--i.e., when needed
- ready access to AFTO forms--for recording installation completions
- tools to support collection/analysis/retrieval of inventory data
- knowledge of (or access to) procedures/information for conducting inspections, checks, and verifications
- knowledge of (or access to) heuristics/rules of thumb for conducting inspections, checks, and verifications
- ready access to forms for documenting results of inspections/verifications
- ready availability of required or specialized cleaning equipment

Specialized: AC Fuel Tank Buildup

- knowledge of (or access to) procedures/information for completing "regulate" and "stabilize" job tasks--i.e., for making adjustments or corrections
- knowledge of (or access to) heuristics/rules of thumb for conducting inspections and for performing "regulate"/"stabilize" tasks
- ready access to job guide--e.g., checks for air leakage in fuel system vents

Specialized: AC Ramp Buildup/Install

- ready access to forms for recording serial number information
- ready access to appropriate lubricants

Specialized: AS Buildup

- availability of AE and AC skills to assist during buildup--i.e., when needed

INSTALLATIONS: AE TCTO Installs, AC Install Wing, AC Install Flight Control

SUPPORT

Generic

- ready access to appropriate equipment/tools (i.e., hardware items) for performing installations, reinstallations, removals, connections, reconnections, adds, and transfers
- knowledge of (or access to) procedures/information (e.g., on-line electronic diagrams) required for conducting installations, reinstallations, removals, connections, reconnections, adds
- aids to support timely retrieval of inventoried components
- availability of parts/components to be installed--i.e., when needed
- knowledge of (or access to) procedures/information for conducting inspections and checks
- ready access to forms for documenting results of inspections/verifications/checks
- knowledge of (or access to) heuristics/rules of thumb for conducting inspections and checks
- readily observable flag notes
- ready access to forms for recording serial number information
- ready access to appropriate lubricants
- availability of support skill (AS skill) during installation

CHECKS: AH Ops Check, AC Ops Check, AE Fuel Ops

SUPPORT

Generic

- ready access to appropriate equipment (i.e., hardware items) for performing ops checks, installations, removals, riggings, inspections, calibrations, and cleanings
- knowledge of (or access to) procedures/information required for conducting ops checks, servicing system components, installations, removals, riggings, inspections, and cleaning
- knowledge of (or access to) information on desired/expected results of ops checks and inspections
- ready access to forms for documenting results from ops checks and inspections
- knowledge of (or access to) heuristics/rules of thumb for conducting ops checks

Specialized: AH Ops Check

- knowledge of (or access to) procedures required for assisting AE and AN ops checks

Specialized: AE Fuel Ops

- ready access to personnel protective equipment--i.e., when needed
- ready assistance from AC skill (overpressure protection shutoff valve checkout procedure)--i.e., when needed

- knowledge of compliance requirements for checks, cautions/warnings, and use of personnel protective equipment
- knowledge of (or access to) information on caution/warning procedures

INSPECTIONS: AE Inspect Engine Bays

SUPPORT

Generic
- ready access to appropriate equipment (i.e., hardware items) for performing inspections and cleaning
- knowledge of (or access to) procedures/information for conducting inspections
- knowledge of (or access to) heuristics/rules of thumb for performing inspections

FACILITATIONS: Accept from Predock, Deliver to FT

SUPPORT

Generic
- ready access to F-15 towing equipment
- knowledge of (or access to) de-arming procedures
- knowledge of (or access to) de-docking procedures
- knowledge of (or access to) information/procedures for securing the F-15

Specialized: Deliver to FT
- availability of AE, AC, and AH skills --i.e., when needed

Classification of Support Requirements

In order to gain an appreciation for the range of support types required for the successful performance of tasks defined for major PDM jobs, we classified each support type according to one of four categories: Equipment, Information, Documentation, and Communication. Equipment-based support types are those that indicate a requirement for specific hardware items. In other words, successful completion of a job task (where the respective job is assigned to a given functional area), is dependent upon a specific piece of hardware or set of hardware items. Examples of equipment-based support types follow, where associated functional areas are provided in parentheses:

- ready access to proper tools/equipment (hardware items of performing removals and disconnects (REMOVALS)
- availability of required or specialized cleaning equipment (REMOVALS, BUILDUPS, INSTALLATIONS, CHECKS, INSPECTIONS)
- ready access to appropriate lubricants (INSTALLATIONS)
- ready access to personnel protective equipment (CHECKS)
- availability of parts/components to be installed (INSTALLATIONS)

Information-based support types indicate cognitive requirements--i.e., requirements for specific domain knowledge, a set of heuristics, or procedural information. Examples of equipment-based support types are listed below, and associated functional areas are provided in parentheses.

- knowledge of (or access to) removal and disconnect procedures (REMOVALS)
- knowledge of (or access to) procedures/rules of thumb for performing manual corrosion inspections (REMOVALS)
- knowledge of (or access to) information on caution and warning procedures (CHECKS)
- knowledge of (or access to) inventory procedures (REMOVALS)
- knowledge of (or access to) compliance requirements for checks, cautions/warning, and use of personnel protective equipment (CHECKS)

Documentation-based support types suggest requirements that address the accuracy of record keeping activities--such that the sharing of accurate maintenance data among Warner-Robins personnel can be ensured. Examples of documentation-based support requirements are listed below.

- methods to support collection/analysis/retrieval of inventory data (BUILDUPS)
- ready access to means/methods for documenting results of inspections and verifications (BUILDUPS, CHECKS, INSTALLATIONS)
- methods to support timely retrieval of inventoried components (INSTALLATIONS)
- ready access to means/methods for recording serial number information (INSTALLATIONS)

Communication-based support types are those that indicate requirements for the coordination between two or more skill types, as well as those that suggest requirements for information exchange. Examples of communication-based support requirements are listed below.

- methods to support timely retrieval of inventoried components (INSTALLATIONS)
- availability of AC skill to assist during *AE Fuel Ops*--i.e., when needed (CHECKS)
- availability of AE and AC skills to assist during *AS Buildup* (BUILDUPS)
- availability of AS skill to assist during installations (INSTALLATIONS)
- methods to support collection/analysis/retrieval of inventory data (BUILDUPS)
- availability of AE, AC, and AH skills during *Deliver to FT* (FACILITATIONS)

In considering these four support type categories and the examples of support type-to-category mappings offered above, we point out that in some instances a given support type is assigned to more than one category. In other words, a one-to-one mapping may not always be appropriate.

Targeting PDM Functions for ITI-ALC Support

Recall that among the sources of information considered in identifying functions to receive the greatest benefit from ITI-ALC technologies were the types of support required for successful completion of critical path jobs and the BPIs that could be addressed by these support areas.

Under the initial ITI-ALC effort, 15 BPIs were identified (SRA, 1995a, 1995b). Based on discussions with University of Dayton Research Institute (UDRI) and Air Force personnel at Wright-Patterson AFB, we selected 10 of these BPIs for consideration. That is, this particular subset of BPIs would be considered in our establishment of support type-to-BPI relationships. These BPIs were selected because in our judgment, they were most relevant to the technology insertions anticipated under ITI-ALC. Table 10 identifies the complete set of 15 BPIs, where BPIs B1 through B10 are those used in our analysis.

Table 10. Business Process Improvements

B1.	Planning Process Enhancement
B2.	Acquire Parts
B3.	Electronic Signatures
B4.	User Technical Information Presentation System
B5.	Integrated Technical and Diagnostics Information
B6.	Visibility into Part Availability
B7.	Multi-Skilled Technicians
B8.	Data Sharing Among all Levels of Maintenance
B9.	Performance Metrics Based on Actual Data
B10.	Preplanned Over and Above/Unpredictables
B11.	Process and Terminology Coordination
B12.	Production Responsibility Centers
B13.	Component Parts Acquisition Policy Changes
B14.	Planning Responsibility Centers
B15.	Three Shifts of Labor

As indicated earlier, each support type was considered in terms of its associated BPIs, where the support type was mapped to those BPIs (i.e., B1 through B10) it addressed. In this manner, each support type was evaluated in terms of the process improvement to which it could contribute. (Note that the details of this analysis are provided in Appendix B. The types of support facilitating job performance are identified, as are the BPIs addressed by each support area.) Tables 11 through 16 summarize results of the mapping exercise for each PDM function--i.e., identifying (for a given function) the BPIs addressed by each type of support and thus showing the relationship between support types and BPIs.

Table 11. Support Type-to-BPI Mapping: REMOVALS

REMOVALS: AE Removals, AN Removals, AC Remove Fuel Tanks

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Generic										
ready access to proper tools/equipment for performing removals and disconnects		X				X		X		X
proper storage arrangements for removed parts	X	X				X		X		X
consistent inventory procedures for removed parts	X	X				X		X	X	X
knowledge of (or access to) inventory procedures	X			X	X	X		X	X	X
knowledge of (or access to) removal and disconnect procedures				X	X					
availability of required or specialized cleaning equipment		X				X		X		
Specialized: AC Remove Fuel Tanks										
proper storage arrangements for #1 tee assembly parts	X	X				X		X		X
knowledge of/access to rules/procedures for performing manual corrosion inspection				X	X				X	
knowledge of/access to process for improving bottom backing board				X	X				X	

TOTALS
number of support types: 9
matrix dimensions: 9 x 10
number of matrix entries: 38
proportion of matrix covered: 38/90 = 0.42

Table 12. Support Type-to-BPI Mapping: BUILDUPS

BUILDUPS: AC Fuel Tank Buildup, AC Ramp Buildup/Install, AS Buildup

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Generic										
ready access to appropriate equipment/tools for performing installations, reinstallations, removals, connections, repairs, and cleanings		X				X		X		
knowledge of (or access to) procedures/ information required for conducting installations, reinstallations, removals, connections, repairs, and cleanings				X	X				X	
availability of parts/components to be installed, reinstalled, connected--i.e., when needed		X				X		X		
ready access to AFTO forms--for recording installation completions			X	X					X	X
tools to support collection/analysis/retrieval of inventory data	X			X		X		X	X	X
knowledge of (or access to) procedures/ information for conducting inspections, checks, and verifications				X	X				X	
knowledge of (or access to) heuristics/rules of thumb for conducting inspections, checks, and verifications				X	X				X	
ready access to forms for documenting results of inspections/verifications			X	X					X	X
ready availability of required or specialized cleaning equipment		X				X		X		
Specialized: AC Fuel Tank Buildup										
knowledge of (or access to) procedures/information for completing "regulate" and "stabilize" job tasks --i.e., for making adjustments or corrections				X	X				X	
knowledge of (or access to) heuristics/rules of thumb for conducting inspections and for performing "regulate"/"stabilize" tasks				X	X				X	
ready access to job guide--e.g., checks for air leakage in fuel system vents				X	X			X		

Table 12. (cont'd) Support Type-to-BPI Mapping: BUILDUPS

BUILDUPS: AC Fuel Tank Buildup, AC Ramp Buildup/Install, AS Buildup

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Specialized: AC Ramp Buildup/Install										
ready access to forms for recording serial number information				X					X	
ready access to appropriate lubricants		X				X		X		
Specialized: AS Buildup										
availability of AE and AC skills to assist during buildup--i.e., when needed	X						X			X

TOTALS
number of support types: 15
matrix dimensions: 15 x 10
number of matrix entries: 49
proportion of matrix covered: 49/150 = 0.33

Table 13. Support Type-to-BPI Mapping: INSTALLATIONS

INSTALLATIONS: AE TCTO Installs, AC Install Wing, AC Install Flight Control

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Generic										
ready access to appropriate equipment/tools for performing installations, reinstallations, removals, connections, reconnections, adds, and transfers		X				X		X		
knowledge of (or access to) procedures/information required for conducting installations, reinstallations, removals, connections, reconnections, adds				X	X				X	
aids to support timely retrieval of inventoried components	X			X		X		X		X
availability of parts/components to be installed --i.e., when needed		X				X		X		
knowledge of (or access to) procedures/information for conducting inspections and checks				X	X				X	
ready access to forms for documenting results of inspections/verifications/checks			X	X					X	X
knowledge of (or access to) heuristics/rules of thumb for conducting inspections and checks				X	X				X	
readily observable flag notes				X						
ready access to forms for recording serial number information				X					X	
ready access to appropriate lubricants		X				X		X		
availability of support skill (AS skill) during installation	X						X			X

TOTALS
number of support types: 11
matrix dimensions: 11 x 10
number of matrix entries: 33
proportion of matrix covered: 33/110 = 0.30

Table 14. Support Type-to-BPI Mapping: CHECKS

CHECKS: AH Ops Check, AC Ops Check, AE Fuel Ops

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Generic										
ready access to appropriate equipment (i.e., hardware items) for performing ops checks, installations, removals, riggings, inspections, calibrations, and cleanings		X				X		X		
knowledge of (or access to) procedures/information required for conducting ops checks, servicing system components, installations, removals, riggings, inspections, and cleaning				X	X				X	
knowledge of (or access to) information on desired/expected results of ops checks and inspections				X	X				X	
ready access to forms for documenting results from ops checks and inspections			X	X					X	X
knowledge of (or access to) heuristics/rules of thumb for conducting ops checks				X	X				X	
Specialized: AH Ops Check										
knowledge of (or access to) procedures required for assisting AE and AN skills				X	X				X	
Specialized: AE Fuel Ops										
ready access to personnel protective equipment --i.e., when needed		X				X		X		
ready assistance from AC skill (overpressure protection shutoff valve checkout procedure)--i.e., when needed	X						X			X
knowledge of (or access to) compliance requirements for checks, cautions/warnings, and use of personnel protective equipment				X	X				X	
knowledge of (or access to) information on caution/warning procedures				X	X				X	

TOTALS
number of support types: 10
matrix dimensions: 10 x 10
number of matrix entries: 31
proportion of matrix covered: 31/100 = 0.31

Table 15. Support Type-to-BPI Mapping: INSPECTIONS

INSPECTIONS: AE Inspect Engine Bays

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Generic										
ready access to appropriate equipment (i.e., hardware items) for performing inspections and cleaning		X				X		X		
knowledge of (or access to) procedures/ information for conducting inspections				X	X				X	
knowledge of (or access to) heuristics/ of thumb for performing inspections				X	X				X	

TOTALS
number of support types: 3
matrix dimensions: 3 x 10
number of matrix entries: 9
proportion of matrix covered: 9/30 = 0.30

Table 16. Support Type-to-BPI Mapping: FACILITATIONS

FACILITATIONS: Accept from Predock, Deliver to FT

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Generic										
ready access to F-15 towing equipment		X				X		X		
knowledge of (or access to) de-arming procedures				X	X				X	
knowledge of (or access to) de-docking procedures				X	X				X	
knowledge of (or access to) information/ procedures for securing the F-15				X	X				X	
Specialized: Deliver to FT										
availability of AE, AC, and AH skills --i.e., when needed	X						X			X

TOTALS
number of support types: 5
matrix dimensions: 5 x 10
number of matrix entries: 15
proportion of matrix covered: 15/50 = 0.30

If we consider the total number of BPIs addressed by the support types associated with each PDM function, Table 17 provides information indicating that the types of support required by the functions BUILDUPS, INSTALLATIONS, and CHECKS contribute to all of the BPIs of interest in this particular analysis, where the support requirements for each of these three functions map to all 10 BPIs. The support types required by the remaining three functions contribute to a lesser extent. Specifically, the support required by jobs under the FACILITATIONS function contributes to 9 BPIs, while the types of support associated with REMOVALS and INSPECTIONS contribute to 8 and 6 BPIs, respectively.

In identifying PDM functions that would most benefit from ITI-ALC technologies, we can consider not only the total number of BPIs to which a given set of support types contribute collectively (as documented in Table 17), but the frequency with which the BPIs are addressed within a given function. That is, by looking more closely at the information contained in Tables 11 through 16, we can investigate the extent to which BPIs are addressed by the support types for a given function. If, for example, a function's respective support requirements address the BPI set to a great extent, the implication is that insertion of ITI-ALC technologies in support of the jobs associated with that particular function would enhance performance of maintenance activities, as well as the process.

Consider Tables 11 through 16. Each table is, in effect, a matrix **M** with elements m_{ij}. Matrix **M** is a *support type* x *BPI* matrix, where the presence of an entry *X* indicates that support type *i* addresses BPI *j*. By considering the data in these tables (i.e., the number and location of table entries), we can determine--for each function--the number of support requirements that address each BPI (i.e., the frequency with which each BPI is addressed by the set of support requirements), as well as the proportion of matrix cells that contain an entry (i.e., the extent to which support requirements contribute to the BPIs of interest).

Table 17. Number of BPIs Addressed by Functions and Respective Support Types

PDM Function	*Number of BPIs Addressed*
BUILDUPS **INSTALLATIONS** **CHECKS**	• 10 of 10 BPIs
B1. Planning Process Enhancement B2. Acquire Parts B3. Electronic Signatures B4. User Technical Information Presentation System B5. Integrated Technical and Diagnostics Information B6. Visibility into Part Availability B7. Multi-Skilled Technicians B8. Data Sharing Among All Levels of Maintenance B9. Performance Metrics Based on Actual Data B10. Preplanned Over and Above/Unpredictables	
FACILITATIONS	• 9 of 10 BPIs
B1. Planning Process Enhancement B2. Acquire Parts B4. User Technical Information Presentation System B5. Integrated Technical and Diagnostics Information B6. Visibility into Part Availability B7. Multi-Skilled Technicians B8. Data Sharing Among All Levels of Maintenance B9. Performance Metrics Based on Actual Data B10. Preplanned Over and Above/Unpredictables	
REMOVALS	• 8 of 10 BPIs
B1. Planning Process Enhancement B2. Acquire Parts B4. User Technical Information Presentation System B5. Integrated Technical and Diagnostics Information B6. Visibility into Part Availability B8. Data Sharing Among All Levels of Maintenance B9. Performance Metrics Based on Actual Data B10. Preplanned Over and Above/Unpredictables	
INSPECTIONS	• 6 of 10 BPIs
B2. Acquire Parts B4. User Technical Information Presentation System B5. Integrated Technical and Diagnostics Information B6. Visibility into Part Availability B8. Data Sharing Among All Levels of Maintenance B9. Performance Metrics Based on Actual Data	

SECTION 4.
IMPLICATIONS

Our objective was to identify PDM functions that would benefit most from the support of ITI-ALC technologies. In arriving at these functions we considered three sources of information: (1) the types of support that would facilitate successful completion of critical path jobs, (2) the set of ITI-ALC BPIs addressed by these support areas, and (3) supervisor insights provided during on-site consultation sessions held at the Warner-Robins Air Logistics Center (WR-ALC).

Functions can be ranked, and ultimately selected, according to various criteria. In this effort, we have considered two criteria: the total number of BPIs addressed by the support types defined for each PDM function and the extent to which BPIs are addressed by the support types defined for each function.

Ranking of PDM Functions: Number of BPIs Addressed

Our analysis suggests that by considering just the number of BPIs addressed by the support types associated with the six PDM functions (the data contained in Table 17), BUILDUPS, INSTALLATIONS, and CHECKS would benefit most from the technologies envisioned under ITI-ALC, followed by FACILITATIONS, then REMOVALS, and lastly by INSPECTIONS. Table 18 provides a ranked list of PDM functions, where functions are ranked in order of decreasing returns from ITI-ALC support. (Again, note that the criterion for prioritization was the number of BPIs addressed by support requirements associated with each function.) In other words, by considering the number of BPIs addressed by the support requirements associated with each function as the ranking criterion, BUILDUPS, INSTALLATIONS, and CHECKS would benefit most from ITI-ALC technologies, while FACILITATIONS, REMOVALS, and INSPECTIONS (in that order) would benefit to a lesser degree.

The high ranking assigned to BUILDUPS and INSTALLATIONS (identifying them as job categories to benefit most from ITI-ALC technologies) is also supported by information obtained during two on-site consultations held at WR-ALC. Specifically, supervisor feedback indicated that problems in process flow could be attributed to delays in *receiving* components that were to be reinstalled during buildups or installations (e.g., inventoried parts, aircraft subsystems being serviced elsewhere). In some instances, for example, the delivery of an aircraft to functional testing can be delayed because a specific subsystem, required for completion of a buildup or installation job, is unavailable when it is needed.

Table 18. Ranking of PDM Functions (Number of BPIs Addressed)

Function	*Number of BPIs Addressed*
1. BUILDUPS AC Fuel Tank Buildup AC Ramp Buildup/Install AS Buildup	10 of 10 BPIs
INSTALLATIONS AE TCTO Installs AC Install Wing AC Install Flight Control	10 of 10 BPIs
CHECKS AH Ops Check AC Ops Check AE Fuel Ops	10 of 10 BPIs
2. FACILITATIONS Accept from Predock Deliver to FT	9 of 10 BPIs
3. REMOVALS AE Removals AN Removals AC Remove Fuel Tanks	8 of 10 BPIs
4. INSPECTIONS AE Inspect Engine Bays	6 of 10 BPIs

Ranking of PDM Functions: Extent to which BPIs Are Addressed

Tables 11 through 16 provide data that indicate--for each function--the extent to which that particular function's respective set of support types addresses the 10 BPIs of interest. One means of measuring this "extent" is to assess the proportion of coverage indicated by the support type-to-BPI mappings indicated in each *support type* x *BPI* matrix--i.e., the proportion of matrix cells that reflect a mapping.

As this proportion increases (i.e., as the density of the matrix representing a given function increases), greater benefit will be obtained through insertion of ITI-ALC technologies into that particular function. By the same token, a lower proportion (indicating a more sparse matrix) suggests fewer benefits to be gained.

Table 19 provides a ranking for PDM functions according to the extent to which BPIs are addressed by their respective support requirements. Under this ranking criterion, the

REMOVALS function receives the greatest benefit from ITI-ALC technologies, followed by the BUILDUPS function. According to the percent coverage values provided in Table 19, CHECKS, INSTALLATIONS, FACILITATIONS, and INSPECTIONS benefit to a lesser extent.

Table 19. Ranking of PDM Functions (Extent to which BPIs Are Addressed)

Function	*Extent to which BPIs are Addressed (Percent Coverage)*
1. REMOVALS	0.42
AE Removals	
AN Removals	
AC Remove Fuel Tanks	
2. BUILDUPS	0.33
AC Fuel Tank Buildup	
AC Ramp Buildup/Install	
AS Buildup	
3. CHECKS	0.31
AH Ops Check	
AC Ops Check	
AE Fuel Ops	
4. INSTALLATIONS	0.30
AE TCTO Installs	
AC Install Wing	
AC Install Flight Control	
FACILITATIONS	0.30
Accept from Predock	
Deliver to FT	
INSPECTIONS	0.30
AE Inspect Engine Bays	

One means of identifying the BPIs addressed most (and least) often by the support types specified for a given PDM function is to examine the frequency with which a given BPI is addressed by those support requirements. In this manner, we can identify the BPI(s) that are most likely to be realized if the corresponding support requirements for the PDM function of interest are satisfied. From the data available in Tables 11 through 16, we can generate a set of frequency distributions across the set of BPIs. (In other words, the number of *X* entries appearing in the column designated to a given BPI will indicate the degree to which the respective function's support requirements contribute to that BPI.) Figures 3 through 8 provide frequency distributions for the six areas of functionality to which the 15 critical path jobs were assigned.

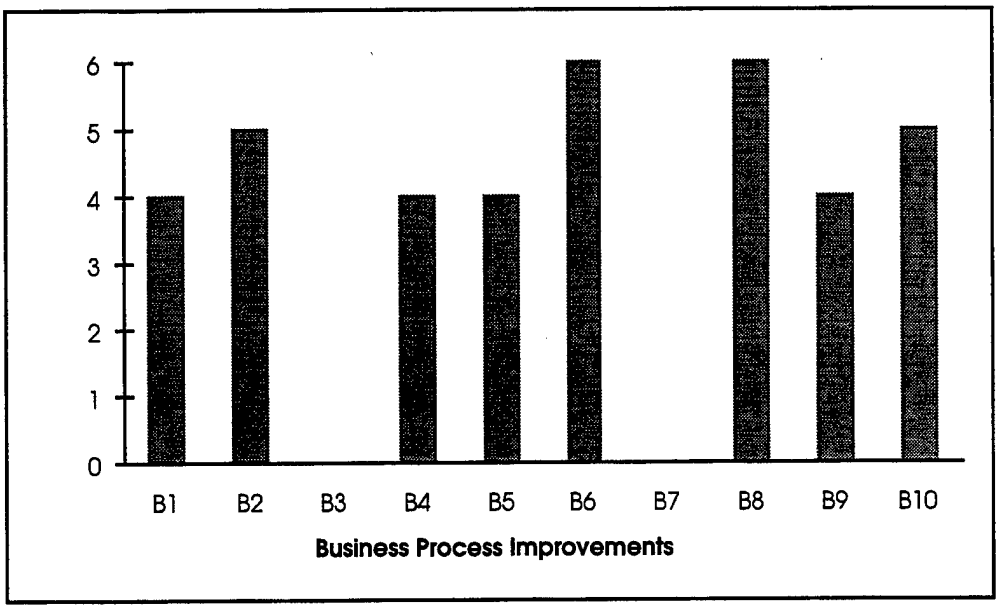

Figure 3. Frequencies with which Support Types Specified for REMOVALS Contribute to ITI-ALC BPIs.

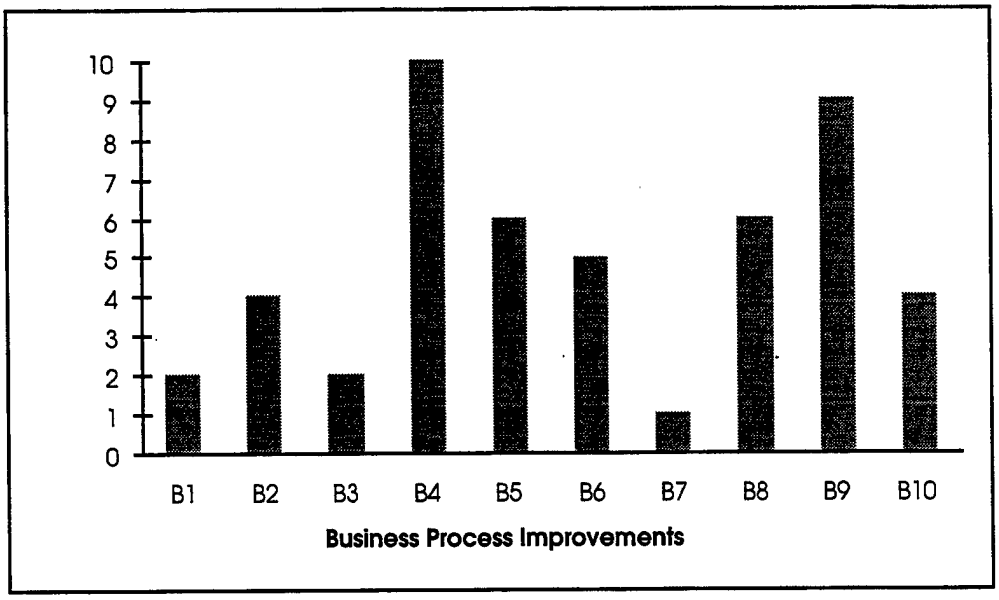

Figure 4. Frequencies with which Support Types Specified for BUILDUPS Contribute to ITI-ALC BPIs.

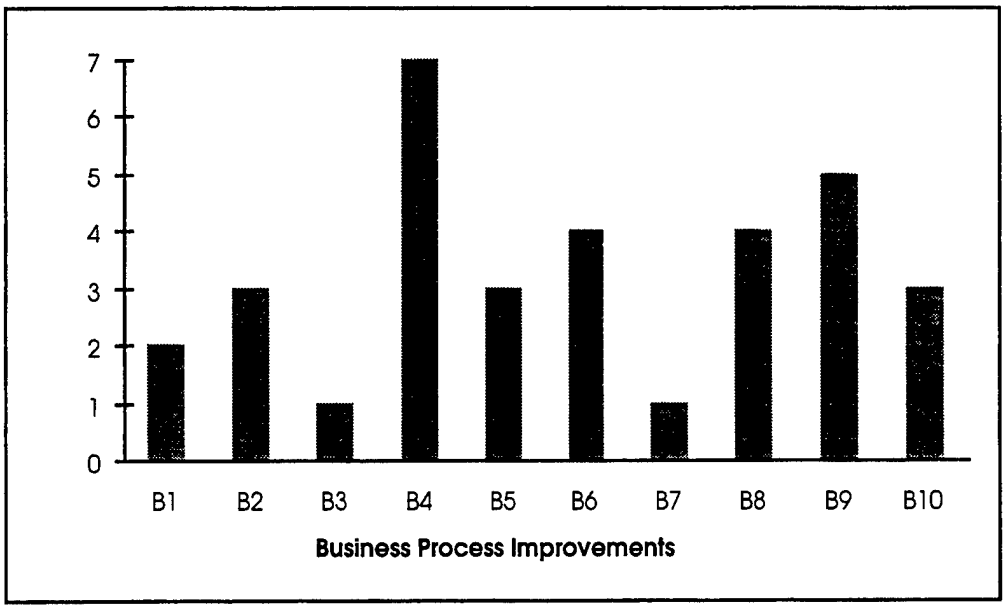

Figure 5. Frequencies with which Support Types Specified for INSTALLATIONS Contribute to ITI-ALC BPIs.

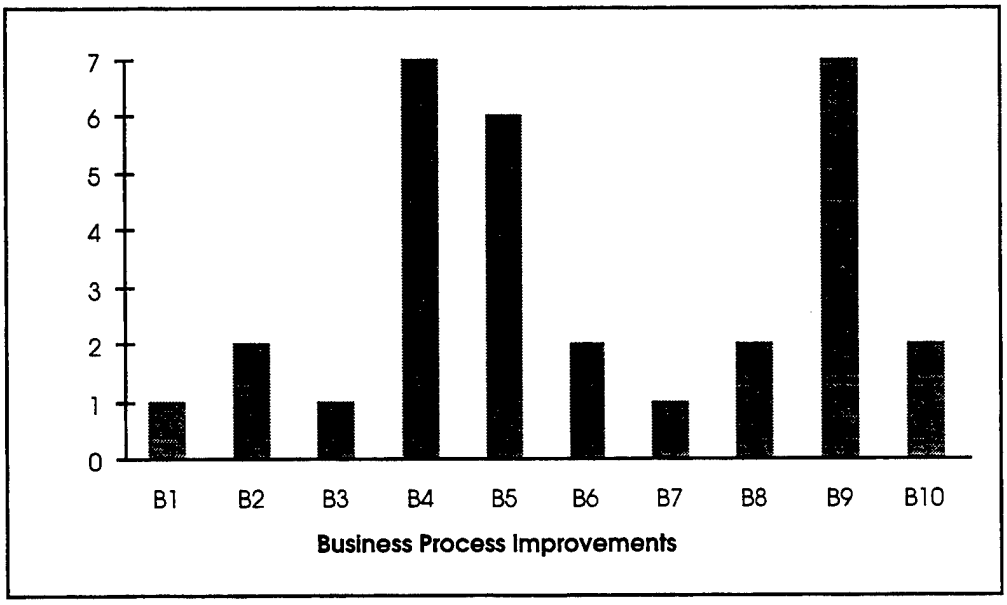

Figure 6. Frequencies with which Support Types Specified for CHECKS Contribute to ITI-ALC BPIs.

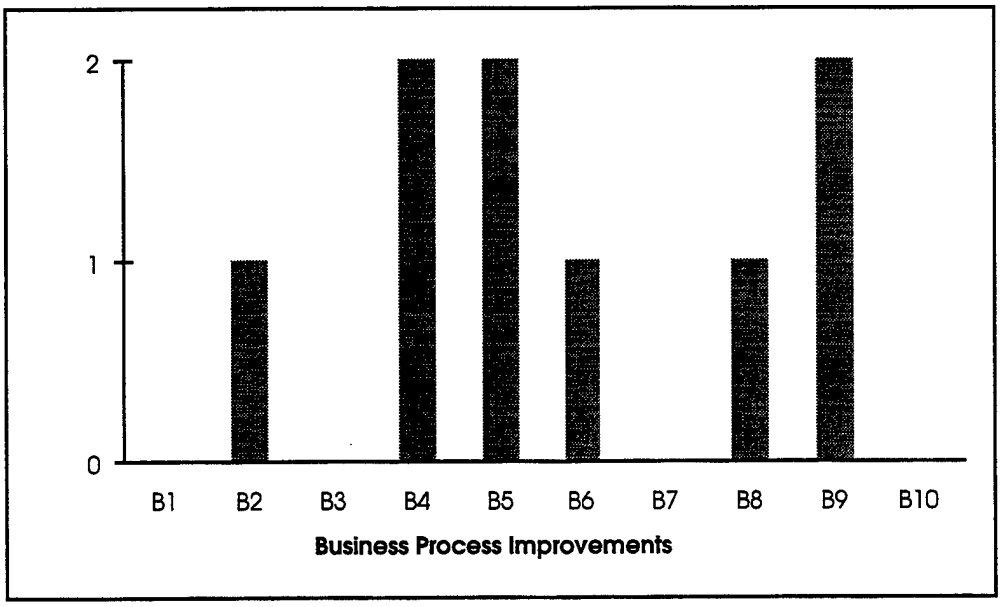

Figure 7. Frequencies with which Support Types Specified for INSPECTIONS Contribute to ITI-ALC BPIs.

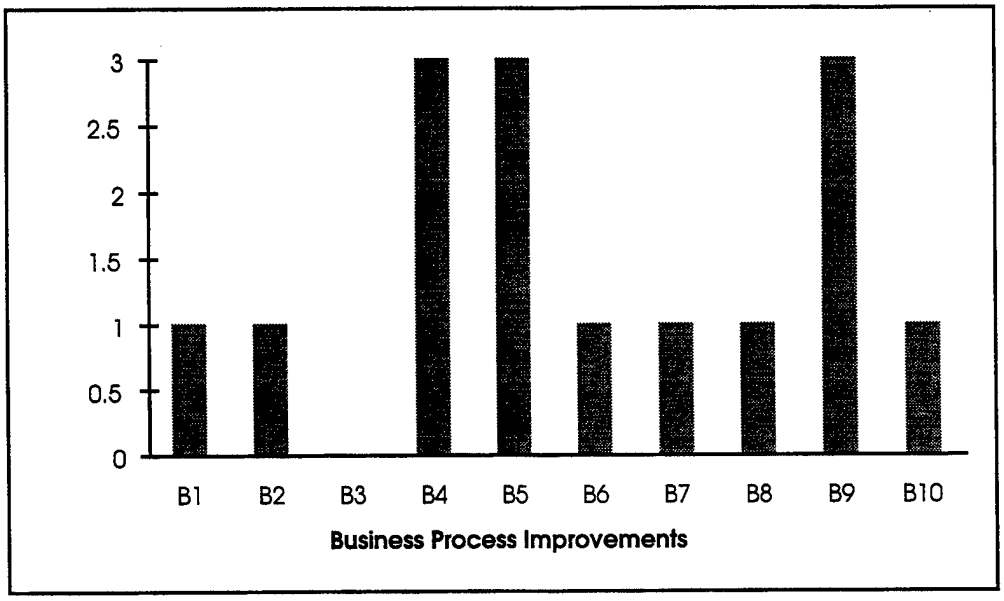

Figure 8. Frequencies with which Support Types Specified for FACILITATIONS Contribute to ITI-ALC BPIs.

Figure 3 suggests that for REMOVALS, the BPIs addressed most frequently by the function's respective support types are *Visibility into Part Availability* (B6) and *Data Sharing Among all Levels of Maintenance* (B8). The BPIs *Acquire Parts* and *Preplanned Over and Above/Unpredictables* (B2 and B10, respectively) are addressed with a slightly lower frequency. Figures 4, 5, and 6 (BUILDUPS, INSTALLATIONS, and CHECKS, respectively) indicate that *User Technical Information Presentation System* (B4) and *Performance Metrics Based on Actual Data* (B9) are addressed most frequently by the functions' support types. Furthermore, support types defined for CHECKS address the BPI *Integrated Technical and Diagnostics Information* (B5) fairly frequently (Figure 6).

Figures 7 and 8 (INSPECTIONS and FACILITATIONS, respectively) also indicate high frequencies for *User Technical Information Presentation System*, *Performance Metrics Based on Actual Data*, and *Integrated Technical and Diagnostics Information* (B4, B9, and B5, respectively). Recall from Tables 15 and 16, however, that the fewest support requirements were specified for INSPECTIONS and FACILITATIONS.

The functions for which the greatest numbers of support requirements have been specified are REMOVALS (9 support types), BUILDUPS (15 support types), INSTALLATIONS (11 support types), and CHECKS (10 support types). For three of these functions (BUILDUPS, INSTALLATIONS, CHECKS), strong mappings to *User Technical Information Presentation System* (B4) and *Performance Metrics Based on Actual Data* (B9) are indicated. This outcome suggests that if the support requirements associated with these functions (and thus with the functions' respective jobs and job tasks) are appropriately satisfied, these two BPIs are the process improvements most likely to be realized. The outcome for REMOVALS, however, is different. Here, the strongest mappings are to *Visibility into Part Availability* (B6) and *Data Sharing Among all Levels of Maintenance* (B8), suggesting that if the support requirements defined for this function are appropriately satisfied, these two BPIs are the process improvements most likely to be realized.

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Systems Research and Applications Corporation (1995b). *Integrated Technical Information for the Air Logistics Centers: System/Segment Specification for the ITI-ALC System* (Contract Number F41624-94-C-5021). Beavercreek, OH: Systems Research and Applications Corporation.

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APPENDIX A.
TASK ANALYSIS RESULTS

Detailed breakdowns of the PDM "critical path" jobs are provided in this appendix. Also included are job breakdowns for other inspections and ops checks not included in the PDM critical path. All Finally, all PDM jobs are categorized according to skill type: AC, AE, AH, AN, AS, miscellaneous.

Accept from Predock
major activity under the job **Accept from Predock** includes docking the F-15 such that PDM and UDLM projects can be completed

AE Removals
major activities under the job **AE Removals** include removing components; performing foreign object damage (FOD) inspection; satisfying inventory requirements for removed components (tag and store removed component for reinstallation); disconnecting electrical connectors; and cleaning locations from which components are removed and disconnected

remove:
landing light
taxi light
right main instrument panel
glare shield (forward cockpit)

inventory (tag/store for reinstallation):
landing light
taxi light
right main instrument panel
glare shield (forward cockpit)

disconnect:
electrical connectors (nose strut wire harness, right/left main landing gear wire harness)
2 EA clamps on nose strut wire harness

inspection:
FOD inspection (all removals and disconnects--excluding glare shield)

cleaning:
clean area (all removals and disconnects--excluding glare shield)

Support:
ready access to proper tools/equipment for performing removals and disconnects
materials for tagging and proper storage arrangements
electronic diagrams/procedures to follow during removals and disconnects
any special equipment required for cleaning areas

AN Removals
major activities under the job **AN Removals** include removing multipurpose displays, processors, power supply and power supply assembly, up front control unit, and avionics interface unit; and satisfying inventory requirements for all removed items (retain removed items for reinstallation)

remove:
multipurpose display (right and left)
up front control unit
power supply assembly
avionics interface unit number 1
signal data processor
power supply
multipurpose display processor

inventory (retain for reinstallation):
multipurpose display (right and left)
up front control unit
power supply assembly
avionics interface unit number 1
signal data processor
power supply
multipurpose display processor

Support:
ready access to proper tools/equipment for performing removals
proper storage arrangements
electronic diagrams/procedures to follow during removals

AC Remove Fuel Tanks
major activities under the job **AC Remove Fuel Tanks** include removing components associated with tanks, residual fuel, and plumbing/hardware; maintaining an inventory of removed components; disconnecting engine feed lines; visually inspecting for corrosion (manual); performing FOD inspection; cleaning locations from which components are removed and disconnected; and cleaning for foam contamination

remove:
negative "G" baffle (#3A fuel tank)
residual fuel (#3A fuel tank)
JFS pressure/suction feed check valves (#3A fuel tank)
engine crossfeed valve (#3A fuel tank)
bladder (#1, #2, #3A, #3B fuel tanks)
plumbing and hardware (#1, #2, #3A, #3B fuel tanks)
backing boards and anti-chafing tape (#1, #2, #3A, #3B fuel tanks)
tee assembly to ensure no trapped fuel in vent line (#1 fuel tank)
left/right honeycomb blocks (#1 fuel tank)

disconnect:
left engine feed lines (#3A fuel tank)

improvement:
improve bottom backing board (#3B fuel tank)

inspection:
FOD inspection (after improvement of #3B bottom backing board)
visual (manual) corrosion inspection (R/aux fuel tank cavity, forward supports)
visual (manual) corrosion inspection (#1, #2, #3A, #3B, fuel tank cavities)

cleaning:
clean area (after removals: negative "G" baffle, plumbing/hardware for #1 and #3A; after improvement of #3B bottom backing board)
vacuum inside of bulkhead adapters (#3A)
clean for foam contamination (#3A)

inventory:
retain tee assembly parts (#1) for reinstallation

Support:
ready access to appropriate equipment for performing removals and disconnects
proper storage arrangements for #1 tee assembly parts
electronic diagrams/procedures to follow during removals and disconnects
any special equipment required for cleaning
rules/procedures for manual corrosion inspection (automated corrosion inspection?)
process for improving bottom backing board

AC Fuel Tank Buildup
major activities under the job **AC Fuel Tank Buildup** include installing many of the fuel tank components removed during the job **AC Remove Fuel Tanks**; recording the completion of installation procedures (via AFTO Form 95 entries); removing/replacing/reinstalling components in support of fuel system vent pressure check; connecting test equipment to the A/C; making pressure adjustments/corrections; conducting inspections/checks; maintaining an inventory of removed parts and test kit caps/plugs; and cleaning

install:
right auxiliary tank top access cover assembly
plumbing and hardware (right auxiliary fuel tank)
foam blocks (right auxiliary fuel tank)
panels (right auxiliary fuel tank)
lower side cover assembly (right auxiliary fuel tank)
foam (#1, #2, #3A fuel tanks)
access panel (#1, #2, #3A, #3B fuel tanks)
access panel bolts (#1, #2, #3A, #3B fuel tanks)
negative "G" baffle (#2, #3A fuel tanks)
foam blocks (#2, #3A, #3B, #1 fuel tanks)

foam baffle (#3B fuel tank)
test plug #1 (pressure test kit) on vent interconnect tube (left/right outboard sides of #3A tank) to support fuel system vent pressure check
plug to vent tube to support fuel system vent pressure check (#1 fuel tank)
fuel quantity tank unit (#3A, #3B, #1, #2)
bladder (#1, #2, #3A, #3B fuel tanks)
plumbing and hardware (#1, #2, #3A, #3B fuel tanks)
fuselage fuel tank backing boards and anti-chafing tape (#1, #2, #3A, #3B fuel tanks)
left/right honeycomb blocks (#1 fuel tank)

remove:
dive vent valve to support fuel system vent pressure check (right auxiliary, #1, #2, #3B fuel tanks)
caps/plugs installed in A/C fuel vent system
jet fuel starter (JFS) feed check valves (#3A fuel tank)
vent tube from bracket assembly to support fuel system vent pressure check (#1 fuel tank)

replace:
dive vent valve with plug (right auxiliary, #1, #2, #3B fuel tanks)

reinstall:
jet fuel starter (JFS) pressure suction feed check valves after cleaning for foam contamination (#3A fuel tank)
dive vent valve (right auxiliary fuel tank)
dive vent valve (#3B, #2, #1 fuel tanks)

connections:
attach air source hose assembly/regulator to test plug #2 to support fuel system vent pressure check
torque access panel bolts (#1, #2, #3A, #3B fuel tanks)

regulate/stabilize ("adjust", "correct"):
adjust regulator to maintain 4±1 psi to A/C vent system plumbing (to support fuel system vent pressure check)
correct for air leaks in fuel system vents (if necessary)

inspection/verification:
closing inspection (right auxiliary tank)
closing inspection (#1, #2, #3A, #3B fuel tanks)
closing inspection of fuel tank cavity (#1, #2, #3A, #3B fuel tanks)
foreign object inspection (#1, #2, #3A, #3B fuel tanks)
foam contamination inspection of JFS feed check valves (#3A fuel tank)
foam replacement verification (#1, #2, #3A, #3B, right/left auxiliary fuel tanks)

checks:
fuel system vent pressure check
air leakage checks (fuel system vents)--using test kit

record:
installation of foam blocks (right auxiliary tank)--AFTO Form 95 entry
installation of foam blocks (#2 fuel tank)--AFTO Form 95 entry
installation of foam blocks (#3A fuel tank)--AFTO Form 95 entry
installation of foam blocks (#3B fuel tank)--AFTO Form 95 entry
foam replacement verification (#1, #2, #3A, #3B, right/left auxiliary fuel tanks)--AFTO Form 95 entry
installation of foam blocks (#1 fuel tank)--AFTO Form 95 entry
installation of bladder (#1, #2, #3A, #3B fuel tank)--part number, date of manufacture, serial number, installation date--AFTO Form 95 entry
installation of fuselage fule tank backing boards and anti-chafing tape (#1, #2, #3A, #3B tank)--AFTO Form 95 entry

perform inventory:
fuel vent system test kit for caps/plugs installed in A/C fuel vent system
JFS feed check valves (#3A fuel tank)

cleaning:
vacuum gravity transfer interconnect valve
vacuum right main boost pump screen
vacuum foam contamination (#2 fuel tank)
clean JFS feed check valves for foam contamination (#3A fuel tank)
clean plumbing and hardware (#1, #3A fuel tank)

compliance:
grommet seated in probe retainer (closing inspection of #1 fuel tank)
grommet seated in probe retainer (closing inspection of #2 fuel tank)
grommet seated in probe retainer (closing inspection of #3A fuel tank)
secondary PAC requirement (plumbing and hardware installation in #1 fuel tank, closing inspection of #1 tank cavity)

<u>*Support*</u>:
ready access to appropriate equipment for performing installations, removals, connections, cleanings
ready access to procedures/information (e.g., diagrams) required for conducting installations, removals, connections, and cleanings
ready access to AFTO forms--for recording installation completions
tools to support collection/analysis/retrieval of inventory data
ready access to procedures/information for conducting inspections, checks, and verifications
ready access to forms for documenting results of inspections/verifications
ready access to procedures/information for completing "regulate" and "stabilize" job tasks--i.e., for making adjustments or corrections
knowledge of (or access to) heuristics/rules of thumb for conducting inspections and for performing "regulate"/"stabilize" tasks
ready access to job guide (e.g., checks for air leakage in fuel system vents)

AE Time Compliant Technical Order (TCTO) Installs
major activities under the job **AE TCTO Installs** include installations/reinstallations of electrical components and accompanying assemblies and attaching hardware; continuity checks and foreign object checks; inspections to ensure presence of components; connections (e.g., from components to attaching hardware); and removals of attaching hardware

install:
M6106/1-003 relay
M6106/4-002 module
68A890347-2673 identification plate
68R767371-71BL cable assembly
hardware
68A810694-1009 cover
sub instrument panel (right/left forward cockpits, right aft cockpit)
5M2478-005 caution light assembly
instrument panel and equipment (right/left forward cockpits, aft cockpit right)
console equipment (left forward cockpit, right aft cockpit)
68A810436-2002 right instrument guard
68A810483-1003 oxygen BIT panel
68A810395-1015 blank panel
right circuit breaker number 3
5M2479-003 or 5M2479-004 caution light assembly
signal data converter
interrogator computer
electrical power generator control unit
68A810023-1027 interior lights distribution panel
no. 1 circuit breaker panel assembly (right)
essential transformer rectifier assembly
signal data converter assembly
holding break switch
ground test diagnostic panel
9M201-19A cover
identification markers (68A890347-2657, -2659, -2663, -2665; 68A890347-2653, -2655)
9M201-19A cover
ST5M1259L1 resistor
clamp (MS21919WDG20) and screw (NAS1801-3-8)--if nonexistent upon cable inspection (ECS bay door 12 area)
NAS43DD3-8 spacer and NAS1801-3-10 screw (left MLG wheel well area, upper right duct door 158R area, right auxiliary hyd bay door 93 area)
75A781015-2005 spacer block and NAS673V7 bolt on ST9M580C1L bracket
NAS43DD3-16 spacer and NAS673V6 bolt (vertical stabilizer door 145R area, right/left boom door (118R, 118L) areas)

retrieve:
retained attaching hardware (for 68A810694-1009 cover)

check:
continuity on added and terminated wiring
foreign object check and close door 3L
foreign object check and close door 6L
foreign object check and close door 10L

reinstall:
console equipment (forward cockpit right)
1K-D146 ground power switching no. 17 relay
1K-D124 avionics protection no. 1 relay
1K-D156 avionics protection no. 7 relay
1K-D157 avionics protection no. 5 relay
68A810693-1007 console access cover
covers and attaching hardware (68A81376-2001, -2005)
covers and attaching hardware (68A810376-2001 or 2003 and -2007)
items listed in para 6F (2) (A) 1-10 (aft crew station left hand support assembly)
items listed in para 6F (3) (A) 1-14 (forward crew station left console)
items listed in para 6F (4) (A) 1-9 (forward crew station main instrument panel)
essential circuit breaker panel

connect:
52J-M090 plug and attaching hardware for 52J-M090 jack
clamps and wire bundles under shelf at FS 279 to FS 290 at WL 103.800 in door 6R

reconnect:
RWR cables at wing disconnect areas

add:
6.00 in. of 14908-1 grommet (ECS bay door 15 area)
1.74 in. of MS21266-2N grommet
1.00 in. of MS21266-1N grommet
3.14 in. of MS21266-2N grommet--if grommet nonexistent upon inspection (vertical stabilizer door 145L area)

inspect:
cable for clamp and screw
cable assembly for chafing
for grommet (vertical stabilizer door 145L area)

remove:
existing screw (left MLG wheel well area, upper right duct door 158R area, right auxiliary hyd bay door 93 area)
existing bolt (vertical stabilizer door 145R area, right boom door 118R area, left boom door 118L area)

reclock:
connector 61J-R006 to 180 degrees from 130 degrees (right wing closure area door 50R area)

loosen/retighten:
clamps--if chafing exists upon cable assembly inspection

reposition:
cable to gain clearance--if chafing exists upon cable assembly inspection

Support:
ready access to appropriate equipment/tools for performing installations, reinstallations, removals, connections, adds
ready access to procedures/information (e.g., diagrams) required for conducting installations, reinstallations, removals, connections, adds
aids to support timely retrieval of inventoried hardware
ready access to procedures/information for conducting inspections and checks
ready access to forms for documenting results of inspections/verifications/checks
knowledge of (or access to) heuristics/rules of thumb for conducting inspections and checks
readily observable flag notes

AC Ramp Buildup/Install
major activities under the job **AC Ramp Buildup/Install** include #1, #2, and #3 ramp installations; alignment and foreign object inspections; checks of rigging; and checks to ensure that FOD curtain bolts are safety wired

install:
#1 ramp (right, left)
#2 ramp (right, left)
#3 ramp (right, left)
diffuser ramp (left, right)

perform rigging:
#1 ramp (right, left)
#2 ramp (right, left)
#3 ramp (right, left)
diffuser ramp (left, right)

reinstall:
side-load-scissors inlet assembly (left ramp, right ramp)

inspection:
inlet alignment (left ramp, right ramp)
A.C.I.
alignment (left diffuser ramp, right diffuser ramp)
PDM
foreign object (left #1 ramp area, right #1 ramp area)

lubricate:
left ramp side-load-scissors inlet assembly (with MIL-G-81322)
right ramp side-load-scissors inlet assembly (with MIL-G-81322)
air induction inlet assembly (left, right)--to comply with 400 hour lubrication

compliance:
400 hour lubrication

cleaning:
#1 ramp area (left, right)

check:
for safety wiring of FOD curtain bolts
rigging (left ramp, right ramp)

record:
serial number (right #1 ramp, left #1 ramp)

Support:
ready access to appropriate equipment/tools for performing installations and reinstallations
ready access to procedures/information (e.g., diagrams) required for conducting installations and reinstallations
ready access to procedures/information for conducting inspections and checks
ready access to forms for documenting results of inspections/checks
knowledge of (or access to) heuristics/rules of thumb for conducting inspections and checks
ready access to forms for recording serial number information
ready access to appropriate lubricants
special equipment required for cleaning areas

AS Buildup
major activities under the job **AS Buildup** include installations and reinstallations (e.g., fasteners, brackets, nutplates), inspections for foreign objects and debris, repair of the cast in left/right side place seals, and cleaning

install:
8 fasteners (removed for eddy current inspection) in right vertical stabilizer tip pod area A
8 fasteners at PNL 116L and PNL 116R (after NDI)
standoff bracket above left rudder pedal
3 nutplates at left and right sides and aft fuselage missile wing forward beam
4 fasteners at left/right sides of bulkhead and outboard side (after NDI)

reinstall:
8 hi-loks per left/right sides (after NDI)
16 hi-loks per left/right sides (after NDI)
1 milson receptacle per left/right sides (after NDI)
1 fire detector bracket per left/right sides (after NDI)

inspection:
FOD inspection (after installation of tip pod area fasteners)

repair:
cast in place seal at left/right sides (after NDI and nutplate installations)

cleaning:
clean area (after installations: 8 fasteners in tip pod area A)

Support:
ready access to appropriate equipment for performing installations, reinstallations, repairs, and cleaning
ready access to procedures/information for conducting inspections, installs (reinstalls), and repairs

AC Install Wing
major activities under the job **AC Install Wing** include the transfer of left and right wings from the transportation vehicle to the installation dolly; installations of left/right wings and the air refueling receptacle; temporary installation of the aft IFR slip-away door; control rod inspections to ensure proper hardware installations in the left and right wings; panel closings; and serial number recordings

transfer:
from transportation onto 4100 installation dolly (left wing, right wing)

install:
left wing
air refueling receptacle
right wing

temporarily install:
IFR slip-away door (aft)

connect:
air refueling receptacle

inspection:
control rods--for proper hardware installation (left wing, right wing)

close:
panels (132L, 137L, 132R, 137R)

record:
serial number (right wing, left wing)

Support:
ready access to appropriate equipment/tools for performing transfers, installations, connections
ready access to procedures/information (e.g., diagrams) required for conducting transfers, installations, and connections
ready access to procedures/information for conducting inspections

ready access to forms for documenting results of inspections
knowledge of (or access to) heuristics/rules of thumb for conducting inspections
ready access to forms for recording serial number information

AC Install Flight Control
major activities under the job **AC Install Flight Control** include installations and reinstallations of flight control components; connections and reconnections; and the recording of serial numbers for installed flight control components

install:
aileron (left, right)
stabilator (left, right)
flap (left, right)
rudder (left, right)
safety strut (F-15 speed brake)
F-15 speed brake
thru-bolt rudder
air refueling receptacle slip-away door mechanism
aileron fairing (left, right)
rudder pedal in rear cockpit (left, right)
right cover plate and attaching hardware (above right rudder pedal)

reinstall:
horizontal stabilator connecting link (left, right)

connect:
air refueling receptacle slip-away door mechanism

reconnect:
rudder cable (left, right)
rudder bellcrank (left, right)
rudder pedal (right)

record:
serial number (left aileron, right aileron)
serial number (left stabilator, right stabilator)
serial number (left flap, right flap)
serial number (left rudder, right rudder)
serial number (left rudder drive fitting, right rudder drive fitting)
A/C serial number
speed brake serial number
position of thru-bolt rudder
serial number (thru-bolt rudder, thru-bolt rudder drive)

lubricate:
servocylinder rod end (left stabilator, right stabilator)
rudder (left, right)
hinge bearings--with MIL-G-81322
rollers and guides--with MIL-G-81322 (air refueling receptacle slip-away door mechanism)

extend:
F-15 speedbrake

attach:
point fitting with MIL-G-81322 (left stabilator, right stabilator)

inspection:
1200 hour

Support:
ready access to appropriate equipment/tools for performing installations/reinstallations and connections/reconnections
ready access to procedures/information (e.g., diagrams) required for conducting installations/reinstallations and connections/reconnections
ready access to procedures/information for conducting inspections
ready access to forms for documenting inspection results
knowledge of (or access to) heuristics/rules of thumb for conducting inspections
ready access to forms for recording serial number information
ready access to appropriate lubricants

AH Ops Check
major activities under the job **AH Ops Check** include operational checks of A/C hydraulics; providing assistance/support to AE and AN skills (e.g., AE and AN ops checks); cleaning areas at which ops checks have been performed; and servicing hydraulics system components

perform checks:
abbreviated LDG operational check
normal brake system operational check
nosewheel steering system operational check
emergency LDG operational check
normal LDG operational check
utility hydraulic system air bleed
operational check on power control hydraulic systems
leak check on power control hydraulic systems
operational check on utility hydraulic system
leak check on utility hydraulic system
abbreviated nosewheel steering operational check

cleaning:
LDG area
brake system area
nosewheel steering system area
ramp system area
canopy area
utility hydraulic system area
power control hydraulic system area
left MLG strut area
right MLG strut area

assist/support:
provide hydraulic assistance for operational rigging check (ramp systems)
support operational checkout of canopy
assist AE skill in performing skid control system checkout
assist AE skill in operational check of brake pulser system
assist AE operational check on augmentation (CAS) control panel
assist AE operational check on tail hook
assist AN skill in performing radar set operational check

conduct maintenance/service:
JFS accumulator prior to towing A/C from moddock to functional test
NLG strut
MLG strut (left, right)

Support:
ready access to appropriate equipment for performing ops checks and cleanings
ready access to procedures/information required for conducting ops checks, servicing system components, and cleaning
ready access to procedures required for assisting AE and AN ops checks
ready access to forms for documenting results from ops checks
knowledge of (or access to) heuristics/rules of thumb for conducting ops checks

AC Ops Check
major activities under the job **AC Ops Check** focus primarily on operational checks for A/C systems (including flight control systems)

perform checks:
air induction operational check (left engine, right engine)
deflection check (left rudder, right rudder)
pitch limits check (left stabilator, right stabilator)
flap operational check
aileron operational check
aileron system rigging check
stabilator system rigging check
free play check (after left stabilator installation)
free play check (after right stabilator installation)

rigging check on speed brake
F-15 canopy system operational check (after installation)
longitudinal control system operational check
lateral control system operational check
rudder system free play check (after rudder installation)
operational check of aileron rudder interconnect
oxygen system operational checkout
oxygen regulator control panel leakage test
oxygen system leakage test
MSOGS concentrator operational checkout (#6R door)

install:
143 stress frames and attached supplements (left, right)

remove:
143 stress frames and attached supplements (left, right)

perform rigging:
flap system
directional control system

Support:
ready access to appropriate equipment for performing ops checks, installations, removals, and riggings
ready access to procedures/information required for conducting ops checks, installations, removals, and riggings
ready access to forms for documenting results from ops checks
knowledge of (or access to) heuristics/rules of thumb for conducting ops checks

AE Fuel Ops
major activities under the job **AE Fuel Ops** primarily include operational checks of electrical system components; inspections for foreign object damage; flushing fuel through refueling receptacles and right/left engine feedlines and single point fueling/defueling receptacle; cleaning; and compliance with all cautions and personnel protective equipment requirements; other activities include calibration of the fuel quantity system; the closing of left/right shutoff valves; and the capping of engine feedlines

perform checks:
emergency generation operational checkout (up to engine checkout)
operational check of fuel trans. pump
operational check of gravity trans. interconnect valve (tank #1)
fuel low level warning operational check
emergency boost pump checkout
overpressure protection shutoff valve checkout procedure
fuel quantity indicator operational checkout
fuel level sensors operational check (tank #1)

inspection:
FOD inspections: upon emergency generation operational checkout, fuel trans. pump, gravity trans. interconnect valve (tank #1), boost pump, overpressure protection shutoff valve, fuel level sensors (tank #1)

cleaning:
upon emergency generation operational checkout
fuel trans. pump area
gravity trans. interconnect valve (tank #1) area
boost pump area
overpressure protection shutoff valve area
fuel level sensors (tank #1) area

calibrate:
fuel quantity system (prior to installation of engine)

close:
fuel shutoff valve (left, right)--prior to calibrating fuel quantity system and installing engine

pull and safety:
S.O.V. circuit breaker (left, right)--prior to calibrating fuel quantity system and installing engine

cap:
engine feedlines--prior to calibrating fuel quantity system and installing engine

flush:
10,000 gal. fuel through refueling receptacle and right engine feedline
10,000 gal. fuel through refueling receptacle and left engine feedline
10,000 gal. fuel through single point refueling/defueling receptacle

receive assistance/support:
from AC skill--overpressure protection shutoff valve checkout procedure

compliance:
electrical portion of internal fuel system pressure leak check
cautions (fuel flushing procedures)
personnel protective equipment (fuel flushing procedure--single point refueling/defueling receptacle)

Support:
ready access to appropriate equipment for performing ops checks, inspections, calibrations, and cleanings
ready access to procedures/information required for conducting ops checks, inspections, and cleanings
knowledge of (or access to) heuristics/rules of thumb for conducting ops checks and inspections
knowledge of (or access to) information on desired/expected results of ops checks and inspections
ready access to forms for documenting results from ops checks and inspections

ready access to personnel protective equipment--i.e., when needed
ready assistance from AC skill (overpressure protection shutoff valve checkout procedure)--i.e., when needed
knowledge of compliance requirements for checks, cautions/warnings, and use of personnel protective equipment
knowledge of (or access to) information on caution/warning procedures

AE Inspect Engine Bays
major activities under the job **AE Inspect Engine Bays** include ensuring compliance with steps 17-17.3; conducting inspections for foreign objects/debris, corrosion, security damage, abrasions, and chafing; and cleaning

compliance:
steps 17-17.3--prior to left/right engine installation

inspection:
FOD inspections: left/right engines (upon complying with steps 17-17.3), left/right engine compartments, fire detection elements (left/right engines), air sensing elements (left/right bleeds)
security damage inspections: electrical cables and connections (left/right engine compartments prior to engine installation), fire detection elements (left/right engines),
corrosion inspections: electrical cables and connections (left/right engine compartments prior to engine installation)
deep abrasion inspections: fire detection elements (left/right engines); air sensing elements (left/right bleeds)
inspection for crushed areas: fire detection elements (left/right engines); air sensing elements (left/right bleeds)
chafing inspections: fire detection elements (left/right engines); air sensing elements (left/right bleeds)

cleaning:
clean areas: left/right engine (upon complying with steps 17-17.3), left/right engine compartments, left/right fire detection elements, left/right bleed air sensing elements

Support:
ready access to appropriate equipment for performing inspections and cleaning
ready access to procedures/information for conducting inspections
knowledge of heuristics for performing inspections

Deliver to FT
major activities under the job **Deliver to FT** include towing the F-15 to the operational check area and then from the operational check area to the purge station; performing dedocking procedures (re-opening/re-closing doors, removing work stands, removing protective covers from sharp edges); dearming the F-15 prior to towing; and in the towing process to secure the F-15 and position the fire bottle

tow:
F-15 to operational check area
F-15 from operational check area to purge station

dedock:
re-open/re-close doors
remove work stands
remove protective covers from sharp edges

compliance:
secure F-15 (during tow)
position fire bottle (during tow)
dearming of F-15 prior to towing

Support:
ready access to equipment for towing the F-15
ready access to dearming procedures
ready access to information/procedures for securing the F-15

OTHER INSPECTIONS

TI Inspection

major activities under the job **TI Inspection** include checks for wear; making measurements as a means of establishing reworking needs; repair and replacement (if necessary) of left/right lower bushings; and notification to NDI prior to installation of bushings

tasks performed by inspector

check:
dimensional check for wear: AMAD mount holes
measurement to determine need for rework: right/left ramp stringer lug

repair:
left/right lower bushing as required

replace:
left/right lower bushing as required

notify:
NDI prior to left/right bushing installation

Support
ready and timely means for completing notifications (e.g., to NDI prior to bushing installation)
ready access to replacement parts
ready access to measurement devices
ready access to tools supporting repair and replacement activities

ready access to replacement/repair procedures
ready access to measurement procedures
ready access to information that defines "wear" and "need for rework" (e.g., tolerances for dimensional checks, rework criteria)

Evaluation & Inventory (E & I) Inspection
a majority of the activities associated with **E & I Inspection** are performed by an inspector, although AC and AE skills provide support (e.g., removals, reinstallations, cleaning, following proper inventory procedures for removed components that removed); visual inspection tasks (conducted with and without magnification glass) are directed toward aircraft systems and subsystems, as well as toward aircraft structure

tasks supported by AC skill

remove:
tube assemblies to facilitate NDI operation

reinstall:
tube assemblies

tasks supported by AE skill

remove:
anti-collision lights from right vertical stabilizer

inspection:
FOD inspection (right vertical stabilizer)

cleaning:
clean area (right vertical stabilizer)

inventory (tag/store for reinstallation):
anti-collision lights

tasks performed by inspector

attach:
fittings (left/right stabilator servocylinder) for cracks, corrosion, and security

visual inspection:
alignment:
jet starter exhaust duct aligned inside of louvered door raised ring
bare/chafing wires:
left/right MLG WOW switch, jury link down limit switch, actuator gear down limit switch
NLG WOW switch

broken binding:
- arresting gear limit and control switches
- arresting hook mechanism
- control stick and control stick linkage
- rudder/brake pedal assembly and rudder spring cartridge

broken pins:
- connectors

broken tabs:
- left/right main landing gear axle nut retaining ring

buckling:
- aft fuselage skin, FS 626.90 to vertical stabilizer, and structure
- center fuselage skin, FS 415.00 to 626.90, and structure
- forward fuselage skin, nose to FS 425.00, and structure

chafing:
- accessible fuel lines in fuselage
- accessible hydraulic lines, pumps, actuators, reservoirs, and landing gear struts (with pressure applied)
- AMAD/JFS overheat and fire detection elements
- electrical connector (aileron rudder interconnect)
- flexible pitot/static hoses
- jet fuel starter starting control manifold, accumulator, gauges, and attaching lines

corrosion:
- accessible areas in cockpit and equipment bay 5 (particularly, floors, walls, and interior surfaces)
- accessible fuel lines in fuselage
- aft fuselage skin, FS 626.90 to vertical stabilizer, and structure
- AMAD mount holes
- bulkhead FS 558.5
- center fuselage skin, FS 415.00 to 626.90, and structure
- central gear box mount holes
- connectors
- control stick and control stick linkage
- forward fuselage skin, nose to FS 425.00, and structure
- ice detection sensing element and sensor strut
- jet starter exhaust duct and door
- jet fuel starter starting control manifold, accumulator, gauges, and attaching lines
- lateral, directional, and longitudinal control feel trim actuators
- left/right air inlet controller
- left/right boundary inlet diverter
- left/right horizontal stabilator bearings
- left/right horizontal stabilator linkages
- left/right horizontal stabilator lower control cables
- left/right inlet stringers, lower attachment pivots, and attaching structure
- left/right main landing gear trunnion bearings
- left/right side load scissors
- left/right stabilator servocylinder
- left/right wing to fuselage attachment pins at FS 509.5 through FS 626.9
- magnetic azimuth detector
- nose landing gear doors, linkages, actuating cylinders

nose landing gear linkages
nose landing gear trunnion bushings
radar antenna
radome hinge
radome hinge back up angle
right/left main landing gear linkages
right vertical stabilizer anti-collision lights
rudder/brake pedal assembly and rudder spring cartridge
rudder control cables, pulleys, attachment bellcranks, and backup structure
splice area and bulkhead FS 509.5

cracked/damaged "T" clip brackets:
425 bulkhead inside of ECS bay

cracks:
accessible fuel lines in fuselage
aft fuselage skin, FS 626.90 to vertical stabilizer, and structure
AMAD mount holes
arresting gear limit and control switches
bulkhead FS 558.5
center fuselage skin, FS 415.00 to 626.90, and structure
central gear box mount holes
control stick and control stick linkage
flex drains on doors (95 L/R, 113 L/R, 117 L/R)
forward fuselage skin, nose to FS 425.00, and structure
jet fuel starter starting control manifold, accumulator, gauges, and attaching lines
jet starter exhaust duct and door
lateral, directional, and longitudinal control feel trim actuators
left/right air inlet controller
left/right boundary inlet diverter
left/right horizontal stabilator bearings
left/right horizontal stabilator linkages
left/right inlet stringers, lower attachment pivots, and attaching structure
left/right main landing gear trunnion bearings
left/right ramp linkages; left/right bypass air doors
left/right side load scissors
left/right stabilator servocylinder
left/right vertical stabilizer upper aft boxes
left/right wing to fuselage attachment bushings at FS 509.5 through 626.9
magnetic azimuth detector
mixer assembly (door 60)
nose landing gear doors, linkages, actuating cylinders
nose landing gear linkages
nose landing gear trunnion bushings
radar antenna
radome hinge
radome hinge back up angle
right/left main landing gear linkages
rudder/brake pedal assembly and rudder spring cartridge

rudder control cables, pulleys, attachment bellcranks, and backup structure
splice area and bulkhead FS 509.5
support bracket (aileron rudder interconnect)

cracks at fastener holes:
left/right vertical stabilizer leading edge closure

cracks extending from prob attachment holes:
left/right inlet duct pivot probe mounting bracket

crimping:
flexible pitot/static hoses

crushing:
AMAD/JFS overheat and fire detection elements (such that tubing diameter is reduced more than 25%)

damage:
center line pylon support assembly bushing
magnetic azimuth detector

damaged fasteners:
left/right boundary inlet diverter

deep abrasions:
AMAD/JFS overheat and fire detection elements

defective clamps:
accessible hydraulic lines, pumps, actuators, reservoirs, and landing gear struts (with pressure applied)

defective splice connections:
left/right MLG WOW switch, jury link down limit switch, actuator gear down limit switch
NLG WOW switch

dents:
AMAD/JFS overheat and fire detection elements

deterioration:
accessible wire harnesses and clamps
jet fuel starter starting control manifold, accumulator, gauges, and attaching lines
oxygen hose aft crew station in console
oxygen hose forward crew station in console

deteriorating paint:
accessible areas in cockpit and equipment bay 5 (particularly, floors, walls, and interior surfaces)

distortion:
ice detection sensing element and sensor strut
left/right bypass air doors
left/right bypass air louvers and screens
control stick and control stick linkage
mixer assembly (door 60);

dry rot:
flexible pitot/static hoses

elongated holes:
AMAD mount holes
central gear box mount holes

FOD:
left/right bypass air louvers and screens
fretting:
left/right boundary inlet diverter
left/right wing to fuselage attachment bushings at FS 509.5 through 626.9
left/right wing to fuselage attachment pins at FS 509.5 through FS 626.9
galling:
left/right wing to fuselage attachment bushings at FS 509.5 through 626.9
left/right wing to fuselage attachment pins at FS 509.5 through FS 626.9
hydraulic leaks:
radar antenna
improper connections:
connectors
improper routing:
flexible pitot/static hoses
kinks:
AMAD/JFS overheat and fire detection elements
leaks:
accessible fuel lines in fuselage
accessible hydraulic lines, pumps, actuators, reservoirs, and landing gear struts (with pressure applied)
aileron rudder interconnect
arresting hook mechanism
left/right stabilator servocylinder
magnetic azimuth detector
nose landing gear doors, linkages, actuating cylinders
leaks (hot gas):
jet starter exhaust duct and door
loose brackets:
right vertical stabilizer anti-collision lights
loose connectors:
right vertical stabilizer anti-collision lights
loose fasteners:
aft fuselage skin, FS 626.90 to vertical stabilizer, and structure
bulkhead FS 558.5
center fuselage skin, FS 415.00 to 626.90, and structure
forward fuselage skin, nose to FS 425.00, and structure
left/right boundary inlet diverter
left/right main landing gear door mechanism torque tube assembly
splice area and bulkhead FS 509.5
loose fittings:
accessible hydraulic lines, pumps, actuators, reservoirs, and landing gear struts (with pressure applied)
missing fasteners:
aft fuselage skin, FS 626.90 to vertical stabilizer, and structure
425 bulkhead inside of ECS bay
bulkhead FS 558.5
center fuselage skin, FS 415.00 to 626.90, and structure

forward fuselage skin, nose to FS 425.00, and structure
left/right main landing gear door mechanism torque tube assembly
nose landing gear doors, linkages, actuating cylinders
radome hinge
radome hinge back up angle
rudder control cables, pulleys, attachment bellcranks, and backup structure
splice area and bulkhead FS 509.5

missing hardware:
arresting hook mechanism

obstructions:
left/right bypass air doors
left/right bypass air louvers and screens

other defects:
radar antenna

overheating:
jet starter exhaust duct and door

proper fit and wear tolerances:
left/right removable engine dropout link and attaching bolts and bushing

proper installation:
engine fire extinguisher bottles

security:
accessible fuel lines in fuselage
AMAD/JFS overheat and fire detection elements
arresting gear limit and control switches
arresting hook mechanism
control stick and control stick linkage
electrical connector (aileron rudder interconnect)
flex drains on doors (95 L/R, 113 L/R, 117 L/R)
ice detection sensing element and sensor strut
lateral, directional, and longitudinal control feel trim actuators
left/right air inlet controller
left/right MLG WOW switch, jury link down limit switch, actuator gear down limit switch
mixer assembly (door 60);
NLG WOW switch
rudder control cables, pulleys, attachment bellcranks, and backup structure
support bracket (aileron rudder interconnect)

serviceability:
left/right main landing gear axle nut retaining ring
right vertical stabilizer anti-collision lights

sheared fasteners:
rudder control cables, pulleys, attachment bellcranks, and backup structure

sheared rivets:
425 bulkhead inside of ECS bay

unsatisfactory conditions:
left main landing gear trunnion bearings
left/right horizontal stabilator linkages
left/right horizontal stabilator lower control cables
left/right inlet stringers, lower attachment pivots, and attaching structure

left/right vertical stabilizer rudder hinge fittings, bearings, bellcrank support, and all accessible areas of stabilizer structure
left/right wing to fuselage attachment bushings at FS 509.5 through 626.9
left/right wing to fuselage attachment pins at FS 509.5 through FS 626.9
right/left main landing gear linkages

warping:
radome hinge
radome hinge back up angle

water/hydraulic fluid intrusion:
accessible wire harnesses and clamps

wear:
AMAD mount holes
central gear box mount holes
left/right boundary inlet diverter
left/right horizontal stabilator bearings
left/right horizontal stabilator linkages
left/right horizontal stabilator lower control cables
left/right inlet stringers, lower attachment pivots, and attaching structure
left/right main landing gear trunnion bearings
left/right side load scissors
left/right wing to fuselage attachment bushings at FS 509.5 through 626.9
left/right wing to fuselage attachment pins at FS 509.5 through FS 626.9
nose landing gear linkages
nose landing gear doors, linkages, actuating cylinders
nose landing gear trunnion bushings
right/left main landing gear linkages
rudder control cables, pulleys, attachment bellcranks, and backup structure

worn fasteners:
rudder control cables, pulleys, attachment bellcranks, and backup structure
lugs attaching variable ramp to fuselage
engine fire extinguisher bottles

visual inspections (with 10x glass):
inspections for oil canning and cracks: nose landing forward bulkhead
inspections for cracks, wear, corrosion, missing or loose fasteners: left/right main landing gear wheel wells
inspections for unsatisfactory conditions: left/right main landing gear wheel wells

check:
dimensional check to verify all conditions of wear: left/right main landing gear trunnion bearings

check (using micrometer):
out-of-tolerance check: nose landing gear trunnion bushings

record/document:
results of E & I inspection

annotate defects on AFLC Form 173:
radar antenna defects

deliver:
E & I inspection results to appropriate A/C

Support:
ready and reliable communication between collaborating skill types
ready access to proper tools/equipment for performing removals and reinstallations
knowledge of (or access to) removal and reinstallation procedures
ready access to any required cleaning equipment
materials for conducting inventory procedures
knowledge of (or access to) inventory procedures
proper storage arrangements for inventoried components
tools to support collection/retrieval of inventory data
knowledge of (or access to) rules/procedures for conducting visual inspections
ready access to equipment to support visual inspections, checks, and measurement checks (e.g., 10x glass, micrometer)
ready access to forms for documenting results from inspections and checks
ready transmittal of inspection results

NDI
major activities under the job **NDI** include the conduct of various types of inspections for cracks: fluorescent penetrant, magnetic particle, eddy current, St. Charles metal, and manual inspections; identifying cracks detected via penetrant inspections with dye; providing notification of detected defects (within 5 days of discovery)

inspection:
fluorescent penetrant inspections for cracks:
- aft fuselage left/right wing attach support lugs
- left/right forward engine mount links
- left/right engine mount aft bracket
- left/right engine mount aft links
- left/right engine mount, body and cap
- right/left forward engine mount link bolts and quick release pins

magnetic particle inspections for cracks:
- left/right inboard/outboard main engine mount bolts
- left/right engine mount to engine adapter

manual inspection for cracks:
- NDI 44 fastener holes upper inboard longerons (forward center fuselage, aft center fuselage)
- NDI right/left wing to fuselage pins
- NDI left/right wing to fuselage bolts

eddy current inspections for fatigue cracks:
- aft fuselage lower stringer number 10 at FS 712
- forward center fuselage FS 466.4 ECS access cover[1]
- aft center fuselage FS 626.9 bulkhead tension cap
- aft fuselage keel center panel

aft fuselage engine access door oil tank cutout
aft fuselage engine access door fuel filter cutout
lower aft engine access door
aft fuselage missile wing, forward beam
FS 712 bulkhead outboard section
aft fuselage stringer number 6 at FS 721 and FS 749
vertical stabilizer leading edge closure[1]
main landing gear piston wall above fork[2]
right vertical stabilizer tip assembly and support

St. Charles metal inspections:
forward center fuselage FS 466.4 ECS access cover
aft center fuselage FS 626.9 bulkhead tension cap
aft fuselage keel center panel
aft fuselage engine access door oil tank cutout
aft fuselage engine access door fuel filter cutout
lower aft engine access door
aft fuselage missile wing, forward beam
FS 712 bulkhead outboard section
aft fuselage stringer number 6 at FS 721 and FS 749
vertical stabilizer leading edge closure

NOTES:
[1]or alternatively, fluorescent penetrant inspection
[2]or alternatively, magnetic particle inspection

dye:
penetrant inspection areas around cracks along either side of seat pan shelf

requirement:
AFTO 3 (inspection of holes)

notify:
LFEF of all detected defects within five days of discovery

Support:
knowledge of (or access to) inspection procedures (manual inspections and equipment-supported inspections)
ready access to equipment required to support inspections
ready and reliable means for transmittal of data on defects (compliance with notification requirements)

AE Ops Check
activities under the job **AE Ops Check** are performed primarily by the AE skill; the AE skill performs activities directly related to electrical systems/subsystems and also supports tasks that focus on other systems/subsystems (e.g., hydraulics, aircraft structure); the AE skill conducts ops checks on electrical systems/subsystems; performs tests; conducts FOD inspections; makes (and verifies) adjustments; observes warnings, cautions, etc. occurring as the result of ops checks; and performs cleaning tasks; the AC skill provides support

task supported by AC skill

check:
avionics flow control modulating valve leak test

tasks performed by AE skill

provide support:
for nose wheel steering rigging
for rigging MLG doors
for rigging NLG doors
for ops check of canopy
for flap rigging check (as required for removal/installation of flap/actuator)
for rudder rigging check (as required for removal/installation of rudder)
for aileron system functional check (as required for removal/installation of aileron actuator and wing)
for rigging check of aileron (as required for removal/installation of aileron)
for stabilator system rigging check
for AC skill--rig AR slipway door mechanism by making door open/close switch adjustment
for AH skill--raise arresting hook
for ops check of longitudinal control system
for ops check of directional control system

perform checks:
clock checkout
BIT checkout:
- avionics air circuit controller
- ADC
- AFCS maintenance sensor and main subset (fwd/aft crew station)
- cabin air circuit controller
- intercom set control panel
- avionics air circuit control

operational checkout:
- angle of attack transmitter and indicating system
- AHRS system
- AFCS hydraulics
- speedbrake
- AMAD/JFS/engine fire and overheat detection system
- interior lights control
- accelerometer counter set
- exterior lighting system
- normal landing gear
- emergency landing gear
- flap actuation system
- interior lighting system (aft cockpit)
- master mode interface
- left/right engine air induction systems
- fuel dump shutoff valve
- skid control system

JFS/AMAD/engine overheat and fire detection system (prior to engine install)
ECS bleed air leak detector system
left/right transformer rectifiers
AOA stall warning tone
vertical speed indicator (fwd/rear cockpits)
standby airspeed
landing gear control panel
brake pulser system
interior lights trim panel
rear interior lights trim panel
interior lights power supply (twice??)
rear interior lights power supply
pitch ratio light panel
fire extinguishing system
interior lights distribution panel
essential transformer rectifier
pitch ratio indicator
emergency landing gear handle
holding brake switch
flap position indicator
ground test diagnostic panel
MSOGS concentrator
OXY BIT/light panel
OXY BIT/light switch
fwd/aft lighting trim panels (after modification)
master caution light/reset switch
emission limit light
pitch ratio switch
standby attitude indicator
environmental control system bleed air leak detection system
JFS/AMAD/engine fire/AB burn through detection system
emission light
normal landing gear system
emergency landing gear system
tail hook
external light control panel

abbreviated operational check:
anti-skid system
normal landing gear
emergency landing gear system

leak checkout:
left/right pitot static system

continuity checkout:
aircraft static ground receptacle (prior to fueling aircraft)
AMAD starter cutout switches (door 87 area)

perform tests:
functional test:
    avionics cooling monitor unit
leak test:
    water extractor

connect:
external electrical power (flap extension)

extend:
speedbrake (after speedbrake ops check)

install:
safety strut (after speedbrake ops check)

pull:
circuit breaker (after speedbrake ops check)

drain moisture:
left/right pitot static system (during leak checkout)

adjustment:
landing light
rudder position transducer (if transducer installed)

verify:
left/right aileron position transducer adjustment (if installed door 47 L/R)

observe:
cautions, warnings, notes (fire extinguishing system ops check)

clean area:
nose wheel steering rigging
MLG doors
NLG doors
avionics air circuit controller
angle of attack transmitter and indicating system
AHRS system
AFCS hydraulics
anti-skid system
left/right pitot static system
speedbrake
canopy
left/right LDG down limit switches
AMAD/JFS/engine fire and overheat detection system
interior lights control
ADC

accelerometer counter set
exterior lighting system
landing gear
flap actuation system
flap rigging
rudder rigging
aileron system
stabilator system rigging
interior lighting system (aft cockpit)
flap extension
left/right engine air induction systems
landing light
fuel dump shutoff valve
AR slipway door mechanism
aircraft static ground receptacle
skid control system
ECS bleed air leak detector system
AMAD starter cutout switches (door 87 area)
left/right transformer rectifiers
AOA stall warning tone
rudder position transducer
brake pulser system
left/right aileron position transducer
arresting hook
longitudinal control system
directional control system
pitot static system purging
interior lights trim panel
rear interior lights trim panel
interior lights power supply
rear interior lights power supply
pitch ratio light panel

follow procedure:
pitot static system purging procedure
PRCA pitch ratio changer procedure (of longitudinal control system ops checkout)

inspection:
FOD:
- nose wheel steering rigging
- MLG doors
- NLG doors
- avionics air circuit controller
- angle of attack transmitter and indicating system
- AHRS system
- AFCS hydraulics
- anti-skid system
- left/right pitot static system

speedbrake
canopy
left/right LDG down limit switches
AMAD/JFS/engine fire and overheat detection system
interior lights control
ADC
accelerometer counter set
exterior lighting system
landing gear
flap actuation system
flap rigging
rudder rigging
aileron system
stabilator system rigging
interior lighting system (aft cockpit)
flap extension
left/right engine air induction systems
landing light
fuel dump shutoff valve
AR slipway door mechanism
aircraft static ground receptacle
skid control system
ECS bleed air leak detector system
AMAD starter cutout switches (door 87 area)
left/right transformer rectifiers
AOA stall warning tone
rudder position transducer
brake pulser system
left/right aileron position transducer
arresting hook
longitudinal control system
directional control system
pitot static system purging
interior lights trim panel
rear interior lights trim panel
interior lights power supply
rear interior lights power supply
pitch ratio light panel

rig:
left/right LDG down limit switches

Support:
ready and reliable communication between all collaborating skill types
knowledge of (or access to) procedures required for performing ops checks, tests, installations, and inspections
knowledge of (or access to) adjustment procedures and adjustment verification procedures

knowledge of (or access to) compliance requirements (for adjustments)
ready access to required equipment for performing checks, tests, installations, inspections
knowledge of (or access to) procedures to follow upon observations of warnings, cautions, etc.

AN Ops Check
major activities under the job **AN Ops Check** include checks and inspections of weapons systems and subsystems

perform checks:
checkout:
- single stores release system
- multiple stores release system
- AIM-7 missile system
- AIM-9 missile system
- AIS/P4AX pod system
- AIM-120 missile system
- GBU-151R guided bomb system

BIT checkout:
- ADF system (electronic control amplifier)
- ICMS
- prog armt control set (PACS)
- countermeasures dispenser set
- TACAN system
- multipurpose color display (MPCD)
- interference blanker
- inertial navigation set
- IFF transponder system
- air-to-air IFF (using test set AN-APM-349)
- AN-ALR-56 countermeasure rec. set
- air-to-air IFF and mode 4 IFF
- EWWS (if installed and operational)
- IFF control panel
- avionics interface unit
- avionics unit
- multipurpose display

operational check:
- MUX bus
- central computer
- avionics status panel
- TACAN system (as applicable)
- TACAN system (aft cockpit)
- control stick grip
- liquid coolant system
- avionics liquid coolant system (as required)
- TEWS display unit
- ILS system
- UHF communications and audio signal system

HUD
radar
multipurpose display system
upfront control
hand controllers
VTRS
caution light display
horizontal warn/caution/advisory lights
AI
remote map reader
intercommunications set control panel

pressurization checkout:
ICMS
radar set

alignment check:
inertial navigation set

assist:
AH skill--antenna hydraulics leakage checkout

provide support:
for F-15 comsec vault requirements (handling, storage, changing maintenance codes, taking inventories each time vault opened)

inspection:
FOD:
MUX bus

for damage:
aircraft electrical connectors (prior to reinstallation of antenna)
glideslope/localizer antenna (prior to reinstallation of antenna)

for cleanliness:
aircraft electrical connectors (prior to reinstallation of antenna)
glideslope/localizer antenna (prior to reinstallation of antenna)

for corrosion:
aircraft electrical connectors (prior to reinstallation of antenna)
glideslope/localizer antenna (prior to reinstallation of antenna)

for foreign objects:
radome area

clean area:
MUX bus

follow procedure:
RWR BIT checkout procedure

warning:
radar ops check--no radar operation while aircraft on jacks or prox. sw. is connected to aircraft control system

compliance:
remove danger tag from radar control PNL (after radar ops check complete)

Support:
ready and reliable communications between collaborating skill types
knowledge of (or access to) procedures required for inspections and checks
ready access to any specialized equipment required for inspections and checks
knowledge of (or access to) procedures to follow upon observations of warnings
availability of warnings
knowledge of (or access to) compliance requirements (i.e., how to comply with warnings presented in job guide, how to comply with warnings received as a result of inspections and checks)
ready access to equipment required for cleaning

AC: Aircraft Skill
DF AC Removals
FL AC TCTO Removals
DC AC Remove Fuel Tanks
FQ AC TCTO Installs
DK AC Fuel Tank Buildup
DV AC Buildup
DZ AC Reposition A/C
DY AC Ramp Buildup/Install
FA AC Install Eng. Mt.
EA AC Install Wing
EX AC Install Flt. Ctl.
ES AC Clean/Close Panels
EM AE Ops Check
EK AC Ops Check
ET AC Fuel Ops
ZZ Deliver to FT

AE: Electrician Skill
FD AE Removals
EY AE TCTO Removals
PS AE Panel Shop
FU AE TCTO Mods
FV AE TCTO Installs
EC AE Buildup
EW AS Buildup
EM AE Ops Check
EU AE Fuel Ops
FI AE Inspect Engine Bays
ZZ Deliver to FT

AH: Hydraulics Skill

FM	AH TCTO Removals
DB	AH Removals
DT	AH Buildup
FR	AH TCTO Mods
FS	AH TCTO Installs
DX	AH Install Gear
HW	AH Install Wing
EQ	Wing Twist Alignment
EJ	**AH Ops Check**
ER	AH Fuel Ops
ZZ	**Deliver to FT**

AN: Weapons Skill

FK	**AN Removals**
FG	AN Buildup
EO	AN Ops Check

AS: Sheet Metal Skill

EZ	AS TCTO Removals
DG	AS Removals
EL	AS TCTO Mods
EH	AS TCTO Installs
DV	AC Buildup
EW	**AS Buildup**

Miscellaneous Skill

Skill	*Job*	
SA	**BW**	**Accept from Predock**
JA	DP	TI Inspection
4A	DQ	4A Clean
DD	DI	E & I Inspection
AP	DW	AP Install AMAD
3S	DS	3S Moddock Paint
DA	DO	NDI
	SP	Support Jobs
AR	FB	Egress Buildup
3S	EF	3S Paint Flt. Ctl. Surfaces
	OI	Misc TCTO/Compliances

APPENDIX B.
MAPPING OF SUPPORT TYPES TO BPIs

REMOVALS: AE Removals, AN Removals, AC Remove Fuel Tanks

SUPPORT

Generic

- ready access to proper tools/equipment (i.e., hardware items) for performing removals and disconnects (BPIs: Acquire Parts, Visibility into Part Availability, Data Sharing Among All Levels of Maintenance)
- proper storage arrangements for removed parts (BPIs: Planning Process Enhancement, Acquire Parts, Visibility into Part Availability, Data Sharing Among All Levels of Maintenance, Preplanned Over and Above/Unpredictables)
- consistent inventory procedures for removed parts (BPIs: Planning Process Enhancement, Acquire Parts, Visibility into Part Availability, Data Sharing Among All Levels of Maintenance, Performance Metrics Based on Actual Data, Preplanned Over and Above/Unpredictables)
- knowledge of (or access to) inventory procedures (BPIs: Planning Process Enhancement, User Technical Information Presentation System, Integrated Technical and Diagnostics Information, Visibility into Part Availability, Data Sharing Among All Levels of Maintenance, Performance Metrics Based on Actual Data, Preplanned Over and Above/Unpredictables)
- knowledge of (or access to) removal and disconnect procedures--e.g., on-line electronic diagrams (BPI: User Technical Information Presentation System, Integrated Technical and Diagnostics Information, Performance Metrics Based on Actual Data)
- availability of required or specialized cleaning equipment (BPIs: Acquire Parts, Visibility into Part Availability, Data Sharing Among All Levels of Maintenance)

Specialized: AC Remove Fuel Tanks

- proper storage arrangements for #1 tee assembly parts (BPI: Planning Process Enhancement, Acquire Parts, Visibility into Part Availability, Data Sharing Among All Levels of Maintenance, Preplanned Over and Above/Unpredictables)
- knowledge of (or access to) rules/procedures for performing manual corrosion inspection (BPIs: User Technical Information Presentation System, Integrated Technical and Diagnostics Information, Performance Metrics Based on Actual Data)
- knowledge of (or access to) process for improving bottom backing board (BPIs: User Technical Information Presentation System, Integrated Technical and Diagnostics Information, Performance Metrics Based on Actual Data)

These support types address the following BPIs:

B1. Planning Process Enhancement
B2. Acquire Parts
B4. User Technical Information Presentation System
B5. Integrated Technical and Diagnostics Information
B6. Visibility into Part Availability
B8. Data Sharing Among All Levels of Maintenance
B9. Performance Metrics Based on Actual Data
B10. Preplanned Over and Above/Unpredictables

Summary:
8 of 10 BPIs

BUILDUPS: AC Fuel Tank Buildup, AC Ramp Buildup/Install, AS Buildup

SUPPORT

Generic

- ready access to appropriate equipment/tools (i.e., hardware items) for performing installations, reinstallations, removals, connections, repairs, and cleanings (BPIs: Acquire Parts, Visibility into Part Availability, Data Sharing Among All Levels of Maintenance)
- knowledge of (or access to) procedures/information (e.g., electronic diagrams) required for conducting installations, reinstallations, removals, connections, repairs, and cleanings (BPIs: User Technical Information Presentation System, Integrated Technical and Diagnostics Information, Performance Metrics Based on Actual Data)
- availability of parts/components to be installed, reinstalled, connected--i.e., when needed (BPIs: Acquire Parts, Visibility into Part Availability, Data Sharing Among All Levels of Maintenance)
- ready access to AFTO forms--for recording installation completions (BPIs: Electronic Signatures, User Technical Information Presentation System, Performance Metrics Based on Actual Data, Preplanned Over and Above/Unpredictables)
- tools to support collection/analysis/retrieval of inventory data (BPIs: Planning Process Enhancement, Visibility into Part Availability, User Technical Information Presentation System, Data Sharing Among All Levels of Maintenance, Performance Metrics Based on Actual Data, Preplanned Over and Above/Unpredictables)
- knowledge of (or access to) procedures/information for conducting inspections, checks, and verifications (BPIs: User Technical Information Presentation System, Integrated Technical and Diagnostics Information, Performance Metrics Based on Actual Data)
- knowledge of (or access to) heuristics/rules of thumb for conducting inspections, checks, and verifications (BPIs: User Technical Information Presentation System, Integrated Technical and Diagnostics Information, Performance Metrics Based on Actual Data)
- ready access to forms for documenting results of inspections/verifications (BPIs: Electronic Signatures, User Technical Information Presentation System, Performance Metrics Based on Actual Data, Preplanned Over and Above/Unpredictables)
- ready availability of required or specialized cleaning equipment (BPIs: Acquire Parts, Visibility into Part Availability, Data Sharing Among All Levels of Maintenance)

Specialized: AC Fuel Tank Buildup

- knowledge of (or access to) procedures/information for completing "regulate" and "stabilize" job tasks--i.e., for making adjustments or corrections (BPIs: User Technical Information Presentation System, Integrated Technical and Diagnostics Information, Performance Metrics Based on Actual Data)
- knowledge of (or access to) heuristics/rules of thumb for conducting inspections and for performing "regulate"/"stabilize" tasks (BPIs: User Technical Information Presentation System, Integrated Technical and Diagnostics Information, Performance Metrics Based on Actual Data)
- ready access to job guide--e.g., checks for air leakage in fuel system vents (BPIs: User Technical Information Presentation System, Integrated Technical and Diagnostics Information, Data Sharing Among All Levels of Maintenance)

Specialized: AC Ramp Buildup/Install

- ready access to forms for recording serial number information (BPI: User Technical Information Presentation System, Performance Metrics Based on Actual Data)
- ready access to appropriate lubricants (BPIs: Acquire Parts, Visibility into Part Availability, Data Sharing Among All Levels of Maintenance)

Specialized: AS Buildup

- availability of AE and AC skills to assist during buildup--i.e., when needed (BPIs: Planning Process Enhancement, Multi-Skilled Technicians, Preplanned Over and Above/Unpredictables)

These support types address the following BPIs:

B1. Planning Process Enhancement
B2. Acquire Parts
B3. Electronic Signatures
B4. User Technical Information Presentation System
B5. Integrated Technical and Diagnostics Information
B6. Visibility into Part Availability
B7. Multi-Skilled Technicians
B8. Data Sharing Among All Levels of Maintenance
B9. Performance Metrics Based on Actual Data
B10. Preplanned Over and Above/Unpredictables

Summary:
10 of 10 BPIs

INSTALLATIONS: AE TCTO Installs, AC Install Wing, AC Install Flight Control

SUPPORT

Generic

- ready access to appropriate equipment/tools (i.e., hardware items) for performing installations, reinstallations, removals, connections, reconnections, adds, and transfers (BPIs: Acquire Parts, Visibility into Part Availability, Data Sharing Among All Levels of Maintenance)
- knowledge of (or access to) procedures/information (e.g., on-line electronic diagrams) required for conducting installations, reinstallations, removals, connections, reconnections, adds (BPIs: User Technical Information Presentation System, Integrated Technical and Diagnostics Information, Performance Metrics Based on Actual Data)
- aids to support timely retrieval of inventoried components (BPI: Planning Process Enhancement, Visibility into Part Availability, User Technical Information Presentation System, Data Sharing Among All Levels of Maintenance, Preplanned Over and Above/Unpredictables)
- availability of parts/components to be installed--i.e., when needed (BPIs: Acquire Parts, Visibility into Part Availability, Data Sharing Among All Levels of Maintenance)
- knowledge of (or access to) procedures/information for conducting inspections and checks (BPIs: User Technical Information Presentation System, Integrated Technical and Diagnostics Information, Performance Metrics Based on Actual Data)
- ready access to forms for documenting results of inspections/verifications/checks (BPIs: Electronic Signatures, User Technical Information Presentation System, Performance Metrics Based on Actual Data, Preplanned Over and Above/Unpredictables)
- knowledge of (or access to) heuristics/rules of thumb for conducting inspections and checks (BPIs: User Technical Information Presentation System, Integrated Technical and Diagnostics Information, Performance Metrics Based on Actual Data)
- readily observable flag notes (BPI: User Technical Information Presentation System)
- ready access to forms for recording serial number information (BPI: User Technical Information Presentation System, Performance Metrics Based on Actual Data)
- ready access to appropriate lubricants (BPIs: Acquire Parts, Visibility into Part Availability, Data Sharing Among All Levels of Maintenance)
- availability of support skill (AS skill) during installation (BPI: Planning Process Enhancement, Multi-Skilled Technicians, Preplanned Over and Above/Unpredictables)

These support types address the following BPIs:

B1. Planning Process Enhancement
B2. Acquire Parts
B3. Electronic Signatures
B4. User Technical Information Presentation System
B5. Integrated Technical and Diagnostics Information
B6. Visibility into Part Availability
B7. Multi-Skilled Technicians
B8. Data Sharing Among All Levels of Maintenance
B9. Performance Metrics Based on Actual Data
B10. Preplanned Over and Above/Unpredictables

Summary:
10 of 10 BPIs

CHECKS: AH Ops Check, AC Ops Check, AE Fuel Ops

SUPPORT

Generic

- ready access to appropriate equipment (i.e., hardware items) for performing ops checks, installations, removals, riggings, inspections, calibrations, and cleanings (BPIs: Acquire Parts, Visibility into Part Availability, Data Sharing Among All Levels of Maintenance)
- knowledge of (or access to) procedures/information required for conducting ops checks, servicing system components, installations, removals, riggings, inspections, and cleaning (BPIs: User Technical Information Presentation System, Integrated Technical and Diagnostics Information, Performance Metrics Based on Actual Data)
- knowledge of (or access to) information on desired/expected results of ops checks and inspections (BPIs: User Technical Information Presentation System, Integrated Technical and Diagnostics Information, Performance Metrics Based on Actual Data)
- ready access to forms for documenting results from ops checks and inspections (BPIs: Electronic Signatures, User Technical Information Presentation System, Performance Metrics Based on Actual Data, Preplanned Over and Above/Unpredictables)
- knowledge of (or access to) heuristics/rules of thumb for conducting ops checks (BPIs: User Technical Information Presentation System, Integrated Technical and Diagnostics Information, Performance Metrics Based on Actual Data)

Specialized: AH Ops Check

- knowledge of (or access to) procedures required for assisting AE and AN ops checks (BPIs: User Technical Information Presentation System, Integrated Technical and Diagnostics Information, Performance Metrics Based on Actual Data)

Specialized: AE Fuel Ops

- ready access to personnel protective equipment--i.e., when needed (BPIs: Acquire Parts, Visibility into Part Availability, Data Sharing Among All Levels of Maintenance)
- ready assistance from AC skill (overpressure protection shutoff valve checkout procedure)--i.e., when needed (BPIs: Planning Process Enhancement, Multi-Skilled Technicians, Preplanned Over and Above/Unpredictables)
- knowledge of compliance requirements for checks, cautions/warnings, and use of personnel protective equipment (BPIs: User Technical Information Presentation System, Integrated Technical and Diagnostics Information, Performance Metrics Based on Actual Data)
- knowledge of (or access to) information on caution/warning procedures (BPI: User Technical Information Presentation System, Performance Metrics Based on Actual Data)

These support types address the following BPIs:

B1. Planning Process Enhancement
B2. Acquire Parts
B3. Electronic Signatures
B4. User Technical Information Presentation System
B5. Integrated Technical and Diagnostics Information
B6. Visibility into Part Availability

B7. Multi-Skilled Technicians
B8. Data Sharing Among All Levels of Maintenance
B9. Performance Metrics Based on Actual Data
B10. Preplanned Over and Above/Unpredictables

Summary:

10 of 10 BPIs

INSPECTIONS: AE Inspect Engine Bays

SUPPORT

Generic

- ready access to appropriate equipment (i.e., hardware items) for performing inspections and cleaning (BPIs: Acquire Parts, Visibility into Part Availability, Data Sharing Among All Levels of Maintenance)
- knowledge of (or access to) procedures/information for conducting inspections (BPIs: User Technical Information Presentation System, Integrated Technical and Diagnostics Information, Performance Metrics Based on Actual Data)
- knowledge of (or access to) heuristics/rules of thumb for performing inspections (BPIs: User Technical Information Presentation System, Integrated Technical and Diagnostics Information, Performance Metrics Based on Actual Data)

These support types address the following BPIs:

B2. Acquire Parts
B4. User Technical Information Presentation System
B5. Integrated Technical and Diagnostics Information
B6. Visibility into Part Availability
B8. Data Sharing Among All Levels of Maintenance
B9. Performance Metrics Based on Actual Data

Summary:
6 of 10 BPIs

FACILITATIONS: Accept from Predock, Deliver to FT

SUPPORT

Generic

- ready access to F-15 towing equipment (BPIs: Acquire Parts, Visibility into Part Availability, Data Sharing Among All Levels of Maintenance)
- knowledge of (or access to) de-arming procedures (BPIs: User Technical Information Presentation System, Integrated Technical and Diagnostics Information, Performance Metrics Based on Actual Data)
- knowledge of (or access to) de-docking procedures (BPIs: User Technical Information Presentation System, Integrated Technical and Diagnostics Information, Performance Metrics Based on Actual Data)
- knowledge of (or access to) information/procedures for securing the F-15 (BPIs: User Technical Information Presentation System, Integrated Technical and Diagnostics Information, Performance Metrics Based on Actual Data)

Specialized: Deliver to FT

- availability of AE, AC, and AH skills --i.e., when needed (BPI: Planning Process Enhancement, Multi-Skilled Technicians, Preplanned Over and Above/Unpredictables)

These support types address the following high and medium priority BPIs:

B1. Planning Process Enhancement
B2. Acquire Parts
B4. User Technical Information Presentation System
B5. Integrated Technical and Diagnostics Information
B6. Visibility into Part Availability
B7. Multi-Skilled Technicians
B8. Data Sharing Among All Levels of Maintenance
B9. Performance Metrics Based on Actual Data
B10. Preplanned Over and Above/Unpredictables

Summary:
9 of 10 BPIs